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MACHINERY

MARCH, 1941

PRINCIPAL CONTENTS OF THIS NUMBER

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April MACHINERY will deal chiefly with the important part played by the Automotive Industry in the production of war materials. Numerous articles describing the manufacture of a wide variety of munitions will indicate how this industry is applying its experience and skill in mass production to the requirements of the National Defense Program.

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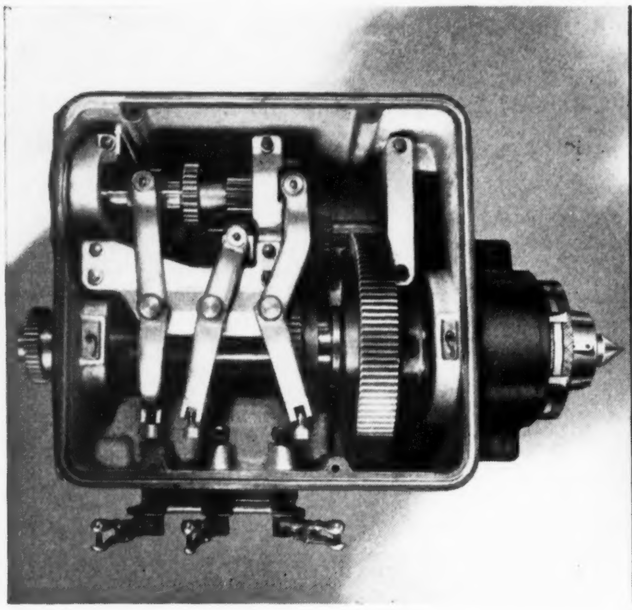
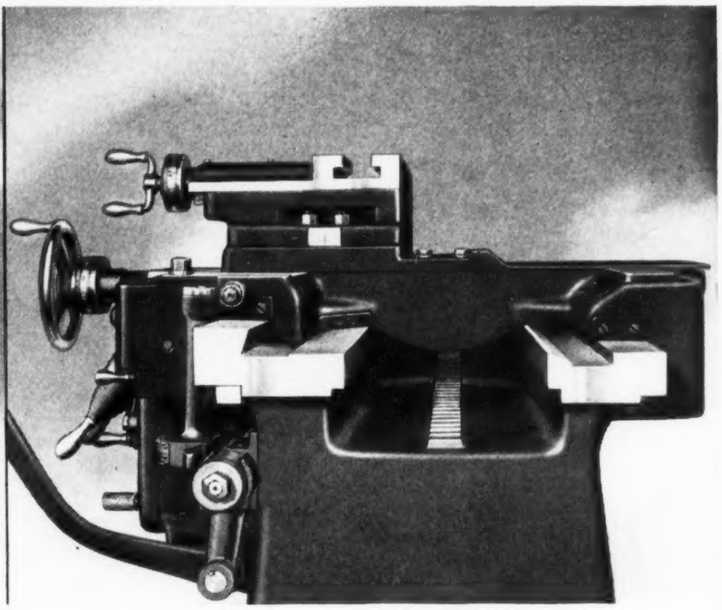
Proper lubrication for the entire lathe is provided. The Headstock is automatically lubricated by a combined pump and splash system, the spindle bearings receive only filtered oil, combined automatic and one-shot lubrication for the Apron, Carriage and Bedways, and a one-shot lubrication system for the Quick Change and End Gearing.



Heat treated, multi spline shafts supported in antifriction bearings carry twelve spur tooth, hardened ground gears. Bores of all gears ground after hardening and the teeth finished ground locating from the ground bore.



Taking full advantage of the rock-like base provided by the bed, the carriage is wider and deeper and brings a new degree of rigidity and strength. The unsupported span of the bridge is greatly reduced.

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The LODGE & SHIPLEY

MACHINERY

Volume 47 NEW YORK, MARCH, 1941 Number 7

Forty-Millimeter Shells for Bofors Anti-Aircraft Guns

Latest Methods Employed in a Canadian Plant to Produce the Projectiles for Guns that Can Shoot 120 Rounds a Minute

By CHARLES O. HERB

GUNS that can shoot 120 shells a minute use up a tremendous amount of ammunition in short order. This is the case with the Bofors anti-aircraft guns, of which there are literally thousands ringed around the large cities of Great Britain in combination with the heavier 3.7-inch anti-aircraft guns. It has been estimated that, in one night-long barrage put up in the defense of London, as many as two million rounds of ammunition may be fired. Even if all these shells were of the 40-millimeter diameter size used in Bofors guns, the amount of steel shot into the air by the defensive forces would amount to two thousand tons. Obviously, the actual figure would be much

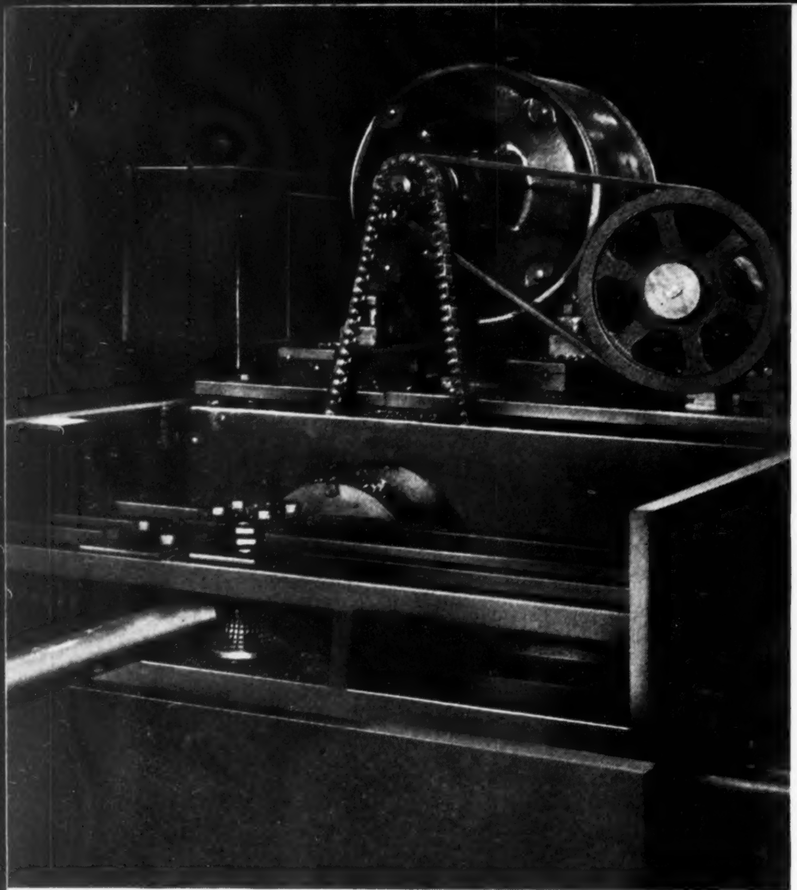


Fig. 1. Machine Employed for Turning Full-length Bars of Steel Stock before They Go to Eight-spindle Conomatics to be Machined into 40-millimeter Shells

higher, because the 3.7-inch shells weigh a great deal more than the 40-millimeter shells.

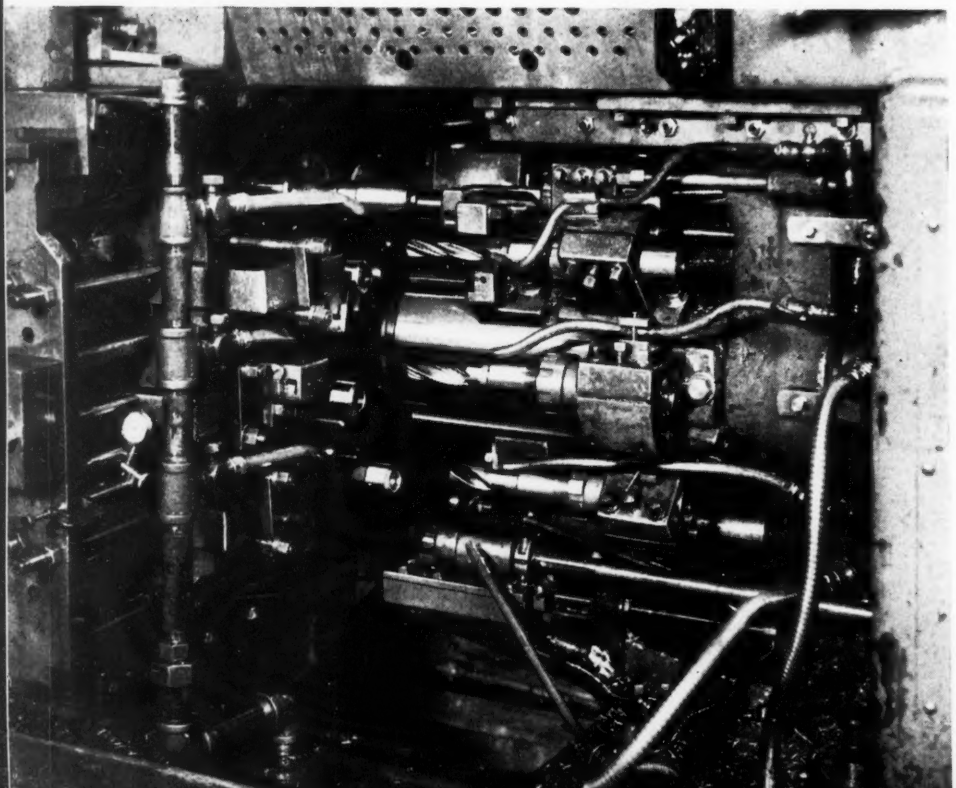
In view of the vast importance of supplying anti-aircraft ammunition in great quantity, the methods employed in a Canadian plant to produce the 40-millimeter (approximately 1 9/16-inch) high-explosive shells for Bofors guns are of especial interest. The shells are produced at high rates of production by the use of eight-spindle Conomatics, the output being 35 shells per hour per machine. Without the explosive charge, fuse, etc., the shell weighs somewhat over 1 1/4 pounds, completely finished.

The shells are produced from bars 1 19/32 inches in diameter by 13 feet in length. After the bars have been hot-drawn at the steel mill, they are normalized by heating to 1650 degrees F. and holding that temperature for one and a half hours. This heat-treatment is necessary in order to refine the grain structure and increase the machinability of the steel. The bars are then straightened before shipment to the shell factory.

When the steel bars reach the shell plant, a test piece is cut off one of the nineteen to twenty-three bars produced from the same ingot, and this piece is tested for tensile strength, elongation, and other physical properties. Then the bars are sent to the special machine shown in Fig. 1, which turns them the full length to suit the collet chucks of the Conomatics. The bar turning machine removes approximately 0.025 inch of stock on the diameter.

In this machine, three cutters are arranged in radial fashion in a revolving head to form a hollow mill that turns the bars as they are fed through the head. This feeding action is accomplished by means of a set of rollers on vertical shafts in front of the cutter-head, as seen in the illustration, and also in back of the head. One roll of each of these pairs is driven, while the other is held firmly against the opposite side of the bar by a spring, so that it, in

Fig. 2. Front Side of an Eight-spindle Conomatic and the Tool Equipment Used for the Production of 40-millimeter Shells from Bar Stock



turn, is revolved by the moving bar. There is also a pair of idler rolls immediately in front of the cutter-head, which insures straight feeding of the bars through the head when each new bar is started. Small rollers are also provided in the cutter-head itself.

When the bars leave this machine, they are straight and turned to the specified diameter within plus or minus 0.005 inch. The feed-rolls pull the stock through this machine at a speed of 8 1/2 feet a minute. The cutter-head is driven directly from the motor through a chain and gears, and rotates at a speed of about 300 R.P.M. Tool bits of high-speed steel are used, tungsten-carbide tools having been found to chip off with the feeding of new bars into the cutter-head. The guards provided on this machine were removed at the time the photograph was taken to permit showing more details than would have been possible with the guards in place.

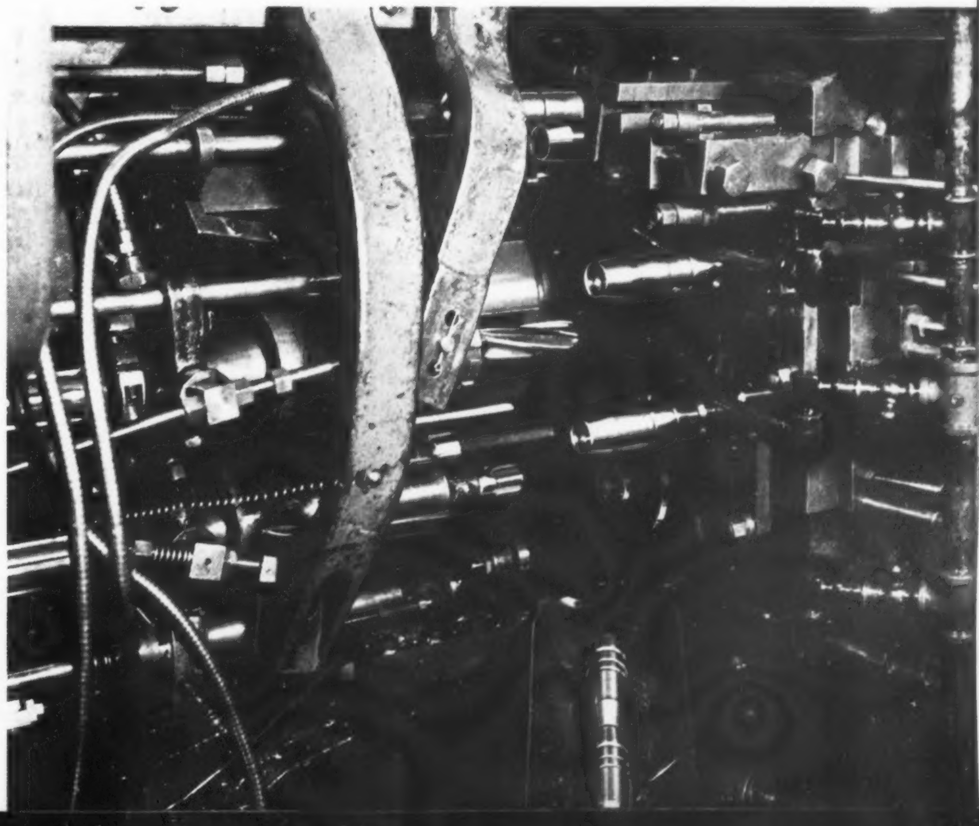
From the bar turning machine the bars go to the Conomatics, which are of the 1 7/8-inch size and tooled up as shown in Figs. 2 and 4. The spindle-carriers are shown in the process of indexing, which accounts for the fact that the work pieces are not in line with the tools in the various stations.

In the first station of the Conomatic, which is in the bottom position, the bar stock is fed forward against a pivoted stop, which swings out of the way to permit the advance of a 1 3/32-inch drill mounted on the tool turret. This tool drills into the end of the bar for a depth of about 3/4 inch to start the taking of internal cuts in the fuse hole end of the shell. At the same time, a knee turner on the tool turret turns the bar for a length of 1 1/4 inches to obtain a finished surface for the rollers of roller type turners to ride against in subsequent stations of the machine.

A 1 1/16-inch diameter drill in the second position on the tool turret starts drilling where the drill in the first station stopped, increasing the depth of

Fig. 3. Grinding the Straight and Tapered External Surfaces of 40-millimeter Shells to within Plus or Minus 0.003 Inch on a Centerless Grinder

Fig. 4. Opposite Side of Conomatic Illustrated in Fig. 2, Showing Finished Shells Dropping into a Chute at the Rear of the Machine



HOW CANADA MAKES MUNITIONS

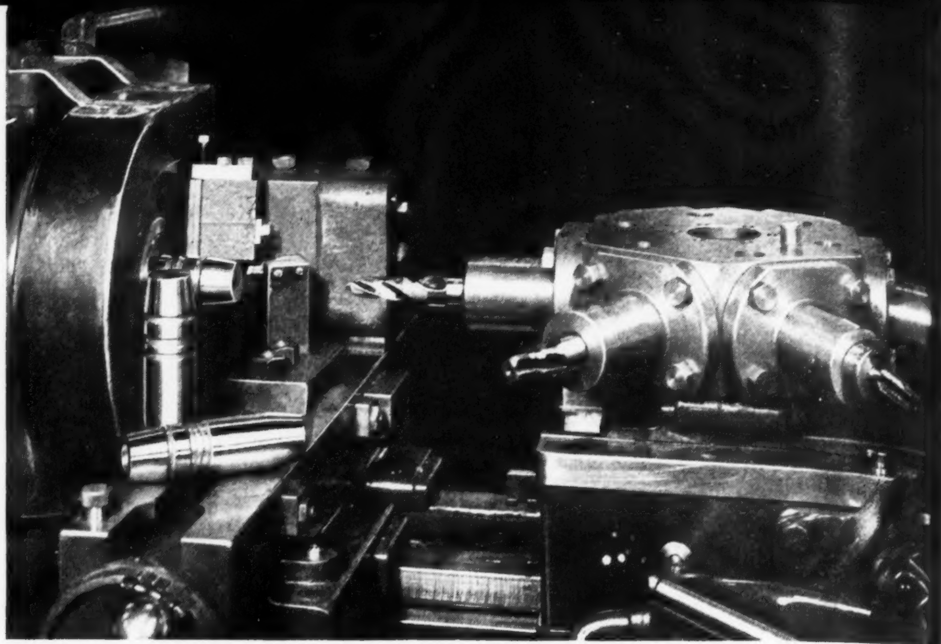


Fig. 5. One of a Battery of Turret Lathes Employed for Machining the Tracer-hole End in 40-millimeter Shells

the hole to approximately 2 1/2 inches. At the same time, a form tool mounted on the front cross-slide starts forming the rear portion of the shell, including the groove for the copper rifling band, except for the wavy annular ridges in this groove, which are machined in a later operation.

The tool turret is provided with another 1 1/16-inch drill in the third station which drills the center of the bar to a depth of 3 3/4 inches. While this tool is in use, a finish-form tool is advanced by the front cross-slide to finish all the surfaces rough-formed in the second station. There is a second tool on the cross-slide in this station for facing the front end of the shell to length. A dial indicator is provided on the cross-slide for setting the finish-form tool accurately.

In the fourth station of the machine, a 51/64-inch drill on the tool turret, which has been ground to the proper contour along the flutes, drills the center of the bar for another length of 1 inch at the inner end of the hole. It forms the tapered portion and the fillets at the bottom of this hole. At the same time, a form cutter on the front cross-slide turns the tapered nose on the fuse end of the shell. In all stations where forming cuts are taken, roller rests are provided on the tool turret to support the bar near the overhanging end.

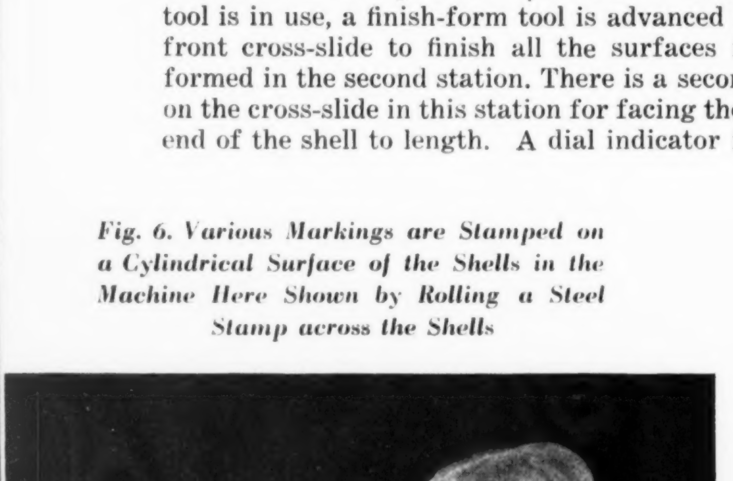
A combination counterbore and reamer is provided on the tool turret in the fifth position, at the top of the machine, to clean out the inner tapered end of the hole, bore the hole at the fuse end for threading, and chamfer the outer corner of the hole so as to eliminate any burrs.

In the sixth position of the automatic, which is seen at the top in Fig. 4, there is an internal necking tool on the tool turret that under-cuts the fuse hole at the inner end of the counterbore to provide clearance for the thread that is to be tapped later. After this tool has been fed to position within the shell, it is fed radially to the required depth of cut as a block on which the tool is mounted slides up along an inclined surface to a predetermined height controlled by a stop. A set of rollers on the tool turret supports the end of the shell in this operation also. At the same time, a form tool on the rear cross-slide finishes the nose on the fuse end of the shell.

The reamer seen on the tool turret in the center of Fig. 4 advances when the shell has been indexed to the seventh station to finish the complete inside of the shell previously drilled, except for the counterbored end. At the same time a "breakdown" tool on the rear slide starts cutting into the bar at the back end of the shell.

Finally, in the eighth station of the Conomatic, a tap on the tool turret threads the counterbored hole in the fuse end of the shell. It cuts Whitworth threads to a pitch diameter of 1.2 inches, fourteen per inch. The tap is rapidly advanced to the end of

Fig. 6. Various Markings are Stamped on a Cylindrical Surface of the Shells in the Machine Here Shown by Rolling a Steel Stamp across the Shells



the shell by an arm pivoted at the top of the machine, and is then moved at a slow feed until the thread has been started, after which the tap feeds itself. The tap revolves in the same direction as the shell, but at a faster rate.

When the tapping operation has been completed, the speed of rotation of the tap is automatically reduced relative to the speed of the work, with the result that the tap backs itself out of the thread. When this has occurred, a cutting-off tool on the rear cross-slide advances and severs the piece from the bar stock. It is apparent from the illustration that the shells drop on a chute and slide to the back of the machine, where they can be readily stacked in boxes by the operator.

In this operation, an effort is made to hold the outside diameter of the shells to the specified size within plus or minus 0.003 inch, although a wider tolerance is permitted. The rifling band groove must definitely be held to the specified diameters within plus or minus 0.005 inch. A high grade of emulsifying cutting oil has been found particularly satisfactory for use on the Conomatics in shell production.

Two straight cylindrical surfaces on the outside of the shell and the tapered ends are next ground to size within plus or minus 0.003 inch on the Cincinnati centerless grinding machine illlustrated in Fig. 3. At the end of this operation, the maximum external diameter on the shells must be between 1.561 and 1.567 inches. The grinding wheel (seen at the right in the illustration) is dressed to the changing contour of the shells, while the regulating wheel, at the left, is trued to two different diameters for contacting the shells on straight surfaces at the front and back. For this operation, each shell is slipped loosely on the end of a wooden rod to facilitate placing it between the grinding and regulating wheels. The operator lowers the shell between the wheels and holds the closed end of the shell against an adjustable stop, as seen in the illustration. The shell revolves freely on the rod while from 0.006 to 0.008 inch of stock on the diameter is ground from the various surfaces. The dressing device, mounted on top of the grinding wheel housing, is provided with a profile bar of the same contour as the desired wheel form.

Turret lathes equipped as shown in Fig. 5 are being used at present to machine the tracer-hole end of the shells, but a further increase in production demands will warrant the use of full automatics. The illustration shows a Warner & Swasey No. 3 turret lathe, but Foster machines are also employed for this operation. The shell is held in a collet chuck. The first station of the turret is equipped with a two-step drill which cuts a hole through the tracer-hole end of the shell to meet the hole produced by the Conomatic in the opposite end. At the end of this drilling step, tools at the back of the cross-slide are advanced for facing the end of the shell and removing stock in the rifling band groove to produce a wavy annular ridge around the bottom of the groove. This wavy ridge is obtained by the sidewise movement of a form cutter on the cross-slide, which is ground with a small V-groove in the center of the cutting edge to suit the height and shape of the wavy ridge.

The sidewise movement of the form cutter is produced by a face cam on the headstock spindle, against which a roller on the form tool-slide is held in engagement by spring pressure. The oscillation of the tool-slide amounts to 1/8 inch, and is made three times for each revolution of the work, so as to produce three "wavers" around the shell. The purpose of this wavy annular ridge is to keep the rifling band that is later assembled in the groove, from turning on the shell when the shell is discharged from the gun.

A two-step reamer on the turret next finishes the hole drilled into the tracer-hole end of the shell accurately to size. Then the turret is indexed again to bring into position a solid tap which cuts left-hand Whitworth threads, 0.834 inch outside diameter, eighteen per inch, in the tracer hole. This step completes the turret lathe operations. Two identical sets of tools are provided on the turret, so that it is not necessary to index the turret through three idle stations each time a new operation is started.

Various markings, including the code number of the steel from which the particular shell is made, a symbol indicating that the shell was made from bar stock, a batch number, company mark, etc., are next stamped on the shell by means of the Noble & Westbrook marking machine illustrated in Fig. 6.

Fig. 7. Burrs are Removed from the Inner End of a Tapped Hole by Employing a Reamer on a Friction-driven Machine Intended Primarily for Tapping

The shell is laid on the table of the machine as shown, and a lever is then operated to roll an overhead stamp across the shell, the latter rolling with the stamp. Since the photograph reproduced in Fig. 6 was taken a motor-driven marking machine of the same make has been added to the equipment of this plant.

A machine built by the Rickert-Shafer Co. primarily for tapping operations is next employed for removing the burr left at the inner end of the tracer hole when it was tapped. As seen in Fig. 7, a reamer is used for this purpose, the operator slipping the shell over the reamer the required distance. When the operator pushes a shell against the reamer, the friction drive to the latter is started automatically; the reamer remains stationary previous to this, so that the shell can be easily slipped over it.

Several inspections and simple corrective operations are next performed. For example, a gage is screwed into the fuse end of the shell and the fit between a flat surface on this gage and the end of the shell must be such that it is impossible to slip a 0.002-inch feeler gage between the two. If the shell does not pass this inspection, a very fine cut is taken on the end in a bench machine.

Assembly of the copper rifling band is then performed in the hydraulically operated West Tire Setter, which is shown in Fig. 8, together with its pump. With the copper band loosely slipped into place on the shell and the latter positioned upright in a bushing in the center of the machine, six jaws are closed tightly on the band. The jaws are tightened and loosened three times in each operation, and the shell is turned about 30 degrees between each gripping. This prevents any marking of the copper band by the jaws. The bands are squeezed together about 0.110 inch on the diameter. They are approximately 5/8 inch wide.

The copper rifling band is next turned on the Roelofson machine illustrated in Fig. 9, which is equipped with tools at the front and back of the cross-slide. A rough-form tool, held vertically at the rear, is first advanced to the work, and then a finish-form tool, mounted horizontally on the front holder, is brought into position. At the end of this operation, the dimensions of the irregular contour that has been turned on the copper band must be as specified within plus or minus 0.002 inch. For this operation, the shell is held in an air-operated chuck and located endwise by a stop. The cross-slide is fed by hand into its two working positions, the operator observing the graduations on the cross-slide handwheel in relation to a pointer attached to the cross-slide.

With the completion of the machining operations as described, the shells are next thoroughly cleansed of all oil and grease in a degreaser unit built by the Canadian Hanson & Van Winkle Co., which utilizes the vapor system. The vapor is produced from Royalene, the temperature of the unit being maintained at around 120 degrees F. It is the practice to place wire-mesh baskets of the shells in the degreaser unit for about fifteen seconds.

Copal varnish is next sprayed on all internal surfaces with a DeVilbiss spray gun having a nozzle that can be inserted into the shells. Each shell is laid on a small trolley for this operation, so that it can be easily rolled back and forth on tracks along the nozzle. The varnish must be sprayed on evenly to insure complete insulation from static electricity, which might set off the explosive charge.

Spraying is accomplished in two operations. After the first coat has been applied, the shells are placed in an electric heating oven for a half hour. The second coat of varnish is then sprayed on, after which the shells are returned to the oven for one and one-half hours. The oven is operated at a temperature of 300 degrees F. Later the effectiveness of the insulation afforded by the varnish is checked through the use of a small two-volt electric lamp bulb. If this bulb lights up when the shell is seated

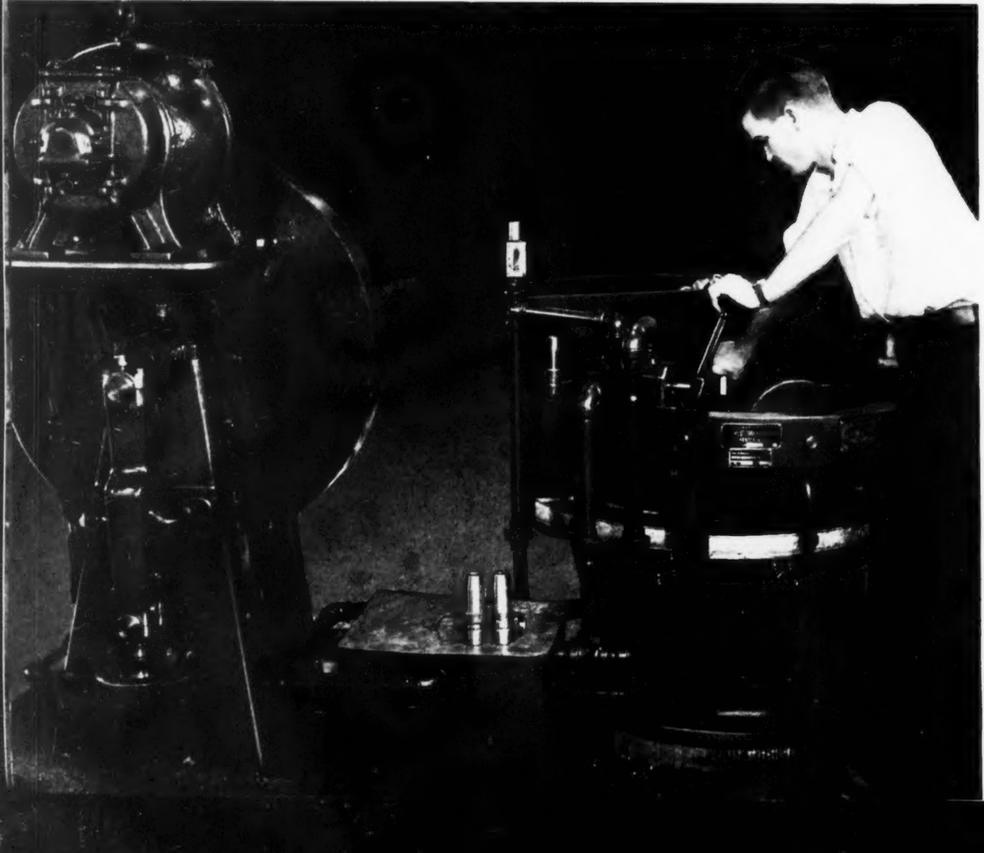


Fig. 8. The Machine Used for Squeezing the Copper Rifling Band in its Groove and the Pump that Supplies the Required Hydraulic Pressure for the Operation

Fig. 9. Equipment Employed for Rough- and Finish-forming the Irregular Surface of the Copper Rifling Band

on an electrode and a contact point wired to the bulb is slid along the varnished surfaces, the shell must go back to the spray bench for revarnishing.

The varnish inspection, as well as many other visual and dimensional checks, is performed along the benches seen in the heading illustration. The shells are also weighed on the Toledo scale shown in Fig. 10. By placing a shell on the tray at one end of the scale beam and weights to the specified amount on the tray at the opposite end of the beam, any difference between the two loads can be observed through a magnifying glass provided at the top of the scale for enlarging the scale graduations.

From this inspection department all shells go to another department, where they are completely rechecked by inspectors who are in the direct employ of the British government. Then thin luting is applied in the threads at both ends and die-cast zinc plugs are screwed into the ends to provide complete sealing of the shells during shipment to the place of loading.

High production has been obtained in this factory not alone through the provision of modern fast-working machine tools, but also through the installation of roller conveyors between the various machines and leading to the inspection benches.

* * *

A new design of drill stem increasingly used in the oil fields has nickel-chromium steel tool-joints of high tensile strength, welded to regular carbon-steel drill pipe.

World's Largest Water-Wheel Generator

The world's largest water-wheel generator was recently shipped from the Westinghouse Electric & Mfg. Co.'s plant at East Pittsburgh, Pa., to the Grand Coulee Dam on the Columbia River in the state of Washington. This is a giant 108,000-K.W. machine, the first of three to be built for the Grand Coulee Dam. It is expected to be ready for operation some time next summer.

The machine weighs almost 1000 tons. On account of its huge size—24 feet in height and 45 feet in diameter—it had to be shipped part by part across the country. The transportation required thirty-eight freight cars. The material, as originally cast or forged for these three machines, included 2255 tons of steel in addition to 300 miles of copper wire, and, when completed, will have required over 1,000,000 man-hours of work. The power capacity of these generators is 30 per cent greater than that of any other water-wheel generator ever built in the United States. The combined capacity of the three machines, when completed, would be sufficient to light the cities of New York and Chicago at the same time. These generators will help furnish power to drive six 65,000-H.P. motor-driven pumps, each of which is capable of lifting 12,000 gallons of water per second.

Fig. 10. Each Shell Must be of the Specified Weight within Three Drams, as Determined by This "Gravitygram" Scale, which is Equipped with a Magnifying Glass for Observing the Graduations

National Machine and Tool Progress Exhibition

CONVENTION HALL, DETROIT, MARCH 25 to 29

THE keynote of the forthcoming National Machine and Tool Progress Exhibition, to be held under the auspices of the American Society of Tool Engineers in Convention Hall, Detroit, Mich., March 25 to 29, inclusive, will be the type of equipment required for the National Defense Program. The interest in defense preparations has influenced, to a large extent, the kind of tools and equipment that many exhibitors have selected for display. Efforts are being made to feature tools and machines most suitable for increasing the productive capacity of manufacturing plants; at the same time, equipment for obtaining utmost precision and close tolerances is being emphasized at this exhibit.

Many new tools and machines will be shown. Of special interest to those rearranging old, or installing new, machinery will be the appliances for reducing installation time that will be on exhibit. For the designing and drafting-room, there will be shown easily adjusted drafting tables, "built like fine steel desks"; drawing and tracing files; and improved drafting instruments designed to help conserve the draftsman's and designer's time. Improved blueprinting equipment will also be on display.

In the field of machinists' tools, there will be a complete exhibit of all types of small tools, cutters, taps, dies, drills, files, boring tools, hobs, counterbores, broaches, etc.

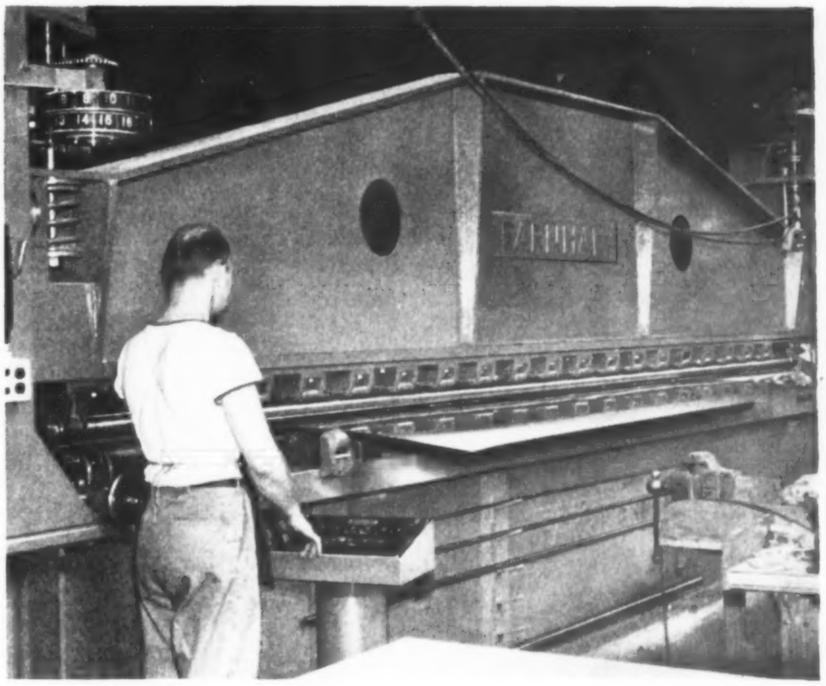
The exhibition promises to be even larger than the imposing exposition staged by the Society two years ago, also in Detroit. A special effort has been made by the Exhibit Committee to encourage exhibits from the standpoint of their interest and value to National Defense Production. All available space in the Convention Hall will be occupied by the exhibits and by the sessions, at which tool engineers and executives from the forty-one chapters of the American Society of Tool Engineers throughout the country will be present. The Show itself is open to anyone engaged in industry who is interested in National Defense tooling and in production problems in general.

The program of the annual convention of the American Society of Tool Engineers, which will be held concurrently with the exposition, will include several important papers on subjects that are of the greatest interest at the present moment. In the sessions of the convention, as in the exhibits, emphasis will be placed on the present emergency, and many of the papers will have a direct bearing upon defense production problems.

It is not necessary to stress in MACHINERY the important part that the tool engineer plays in our entire production system, whether the work is done for peaceful purposes or for defending the institutions that we have built up against forces that appear to be bent upon destroying them. Without the tool engineer and his work, mass production of war materials—one of the most important factors in successful defense—could not be carried through to a successful conclusion. The important position held by the tool engineer in the industrial structure will be emphasized by the great exhibit of machine shop tools and equipment to be sponsored by the American Society of Tool Engineers in Detroit a few weeks hence.

Operations in Building Flying Boats

Manufacturing Operations in the Plant of the Consolidated Aircraft Corporation, San Diego, Calif., which is Now Building Land Planes, as well as Flying Boats



OUTSTANDING operations in the machine shop and sheet-metal department of the Consolidated Aircraft Corporation, San Diego, Calif., were described in an article that appeared in July, 1940, MACHINERY, page 188. The present article is a continuation of the previous one; it will deal with additional operations in the forming and testing of metal parts, and will also describe the features of the paint spray booths recently installed in this plant.

The heavier sheet duralumin now being used for curved plane surfaces necessitates preforming the material to the desired contour, whereas the thinner material previously used could be wrapped around the leading edges of wings, etc. For the preforming of sheet duralumin, the Consolidated Aircraft Corporation recently installed the Farnham bending rolls illustrated in Fig. 11, which have a roll span of 20 feet. This machine is open at the right-hand end, so that formed sheets of metal can be withdrawn endwise from the rolls.

The operation of the three rolls on the machine is conveniently controlled through the stand in front of the operator, which is provided with electric push-buttons that govern the forward and reverse rotation of the rolls, the vertical adjustment of the top roll, and the in and out adjustment of the two bottom rolls. The bottom and top rolls are 3 1/2 and 2 3/4 inches in diameter, respectively.

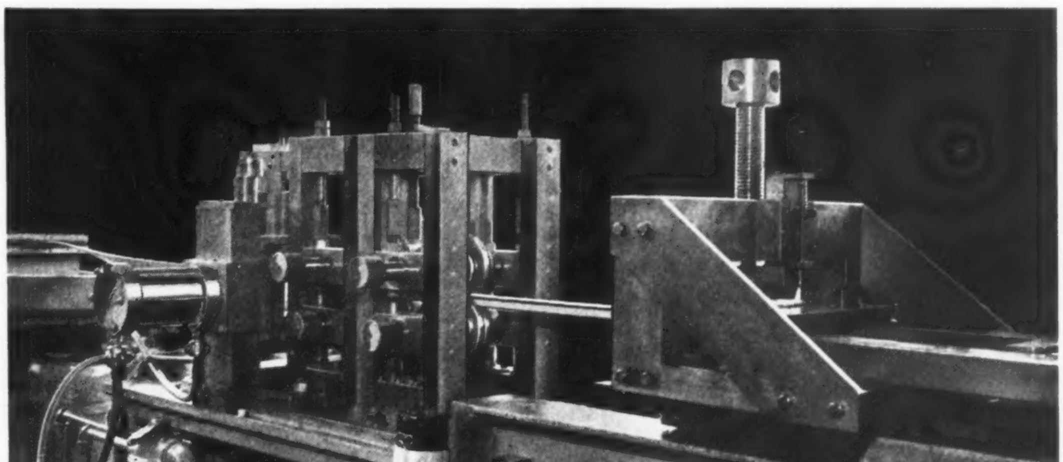


Fig. 11. (Above) Large Roll-bending Machine Employed for Preforming Sheet Duralumin Used for Wing Covering and Purposes of a Similar Kind

Fig. 12. (Left) Thousands of Feet of Formed Sections are Produced by the Rolls of This 60-foot Draw-bench as the Material is Pulled through the Rolls by a Carriage

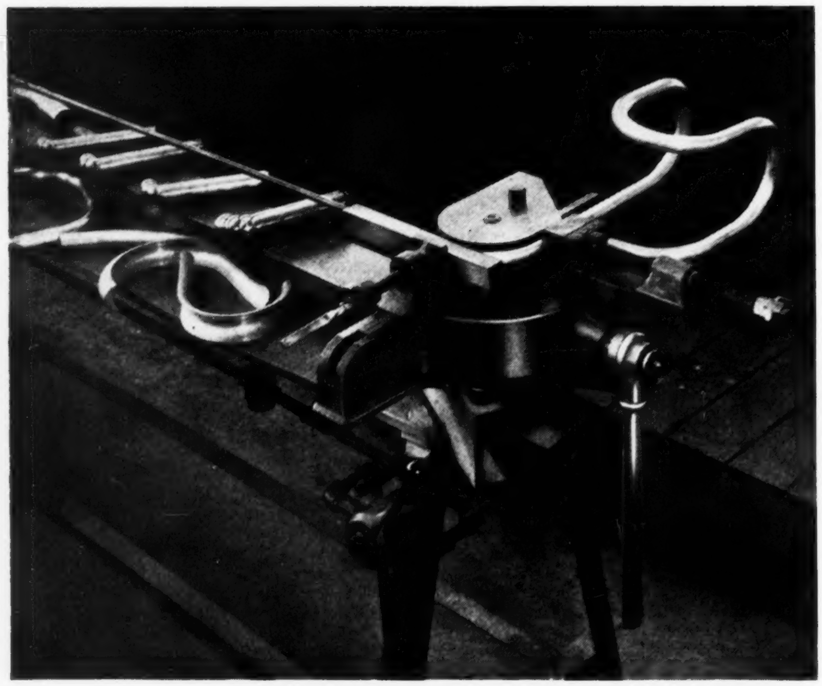


Fig. 13. One Type of Equipment Used for Producing the Large Variety of Bent Tubes Required for the Oil and Gasoline Lines, De-icer and Anti-icer Equipment, etc., on Airplanes

When parts are designed to the close factors of safety required in aircraft building, extensive tests must be conducted to insure that they will not fail in service. In Fig. 14 is shown a machine widely used for such inspections—a Southwark - Emery compression - tension testing machine—which has a capacity of 200,000 pounds. The illustration shows this machine being used for checking a fitting that is built up of structural shapes, forgings, and aluminum-alloy sheets riveted together.

Three large spraying booths, which have been installed in the paint shop for painting plane details and assembled units, make the painting department one of the most modern in the aircraft industry. In Fig. 15, the hull for a twin-engined flying boat is seen in one of these booths after having been painted. Warm filtered air is constantly forced into the entire paint shop, and the paint- or lacquer-laden air is sucked out from numerous points, such as along the bottom of the spray-booth enclosures. This impure air travels upward against a spray column of water and then through filters before being exhausted outside of the building, practically devoid of all paint. The entire interior of this department is painted white and is provided with north light.

The draw-bench used to form thousands of feet of sections from Alclad flat strip, such as hat-shaped stringer stock, is illustrated in Fig. 12. This machine consists of a set of forming rolls at the left-hand end which shape the stock to the required cross-section as it is pulled through the rolls by a carriage. The carriage is moved along a structural steel table or bench over 60 feet long, the machine being driven by a 50-H.P. motor. Care is taken in handling all aluminum alloy stock to guard against marring the surfaces.

Tube-bending plays an important part in the construction of modern airplanes, in view of the large amount of tubing required for oil and gasoline lines, electrical conduits, de-icer and anti-icer equipment, instrument leads, carbon-dioxide lines, etc. On a Consolidated Model 28 twin-engined flying boat, for example, there are over 800 feet of tubing used for such purposes.

A Parker tube-bending machine, which finds extensive use in this plant, is illustrated in Fig. 13. A rather complicated piece of bent tubing is seen in the machine, and other typical examples are shown on a bench in front of some of the ball-end mandrels that are used on the inside of tubes at the bending point to prevent collapse of the thin tubing walls.

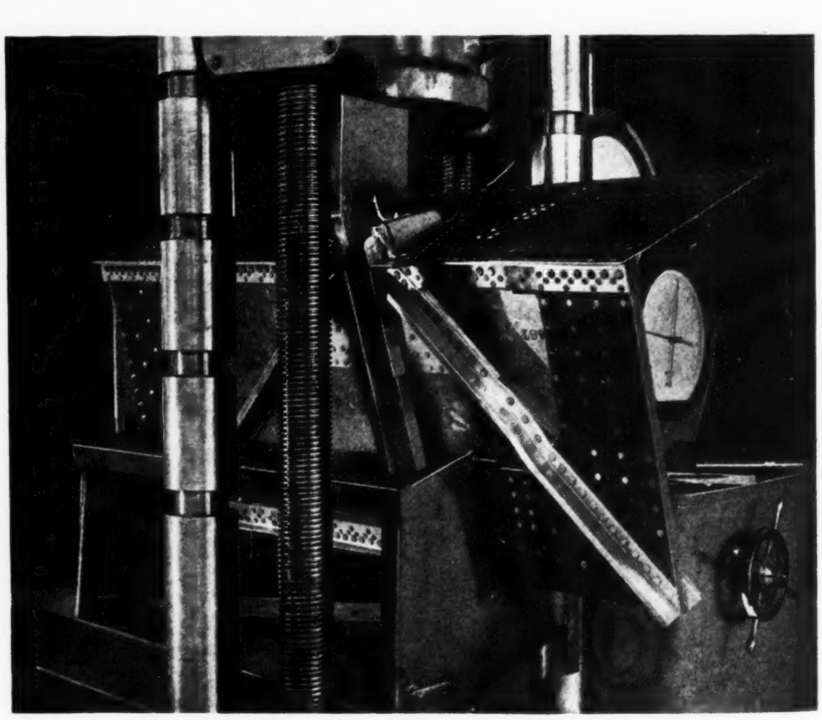


Fig. 14. Checking a Fitting that is Built up of Extruded and Formed Aluminum-alloy Shapes and Sheets on a Compression-tension Testing Machine

Machine Tool Manufacturing Progress

How the nation's machine tool industry is turning out lathes, milling machines, boring mills, planers, and a great number of other types of machine tools for the Defense Program at the rate of $650,000,000 a year—almost four times the production rate of the peak year of 1929—is told in a booklet entitled "Machine Tools," which has recently been published by the National Machine Tool Builders' Association, 10525 Carnegie Ave., Cleveland, Ohio. The industry has been training and employing new men, so that practically every important plant is running day and night; in fact, employment has doubled in the last fifteen months.

The booklet describes the part that machine tools are playing in the National Defense Program. Among the interesting developments referred to as illustrative of the special-purpose machines being built by the industry to speed up defense production is a 24-ton, automatic machine for roughing out marine engine cylinders. This machine operates on six cylinders at one time, and has reduced the machining time per cylinder from four hours, as required with the methods that were formerly employed, to less than thirty-five minutes.

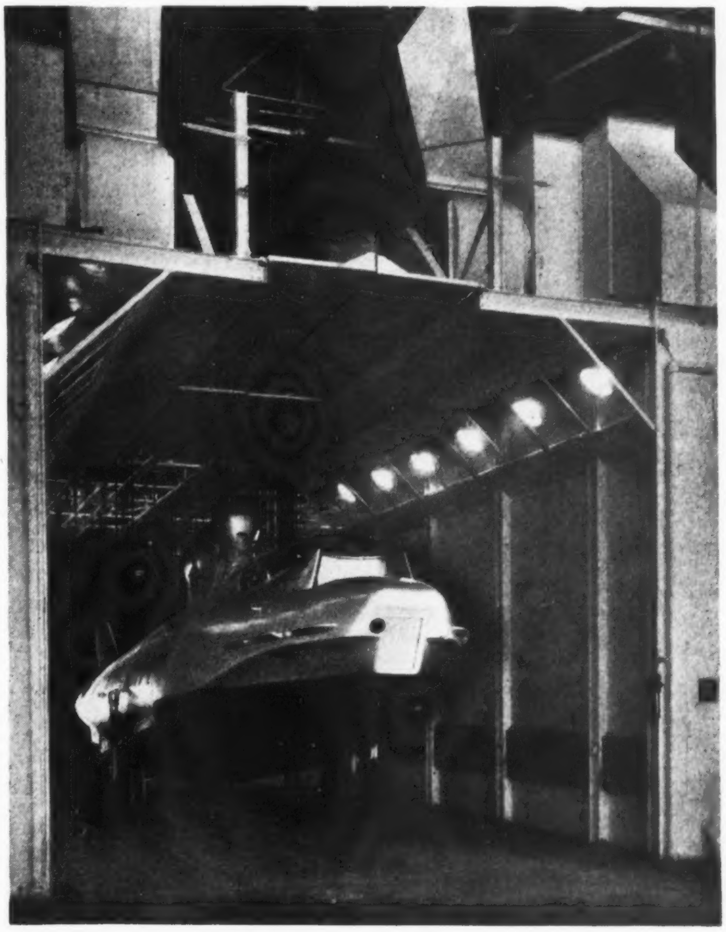


Fig. 15. One of Three Modern Paint Spray Booths, Showing the Painted Hull for a Twin-engined Flying Boat

* * *

As an indication of the great increase in production in industry, it might be mentioned that the ingot production of the Inland Steel Co., Chicago, Ill., for the month of January was 297,381 net tons, which is actually 108.1 per cent of the company's rated ingot capacity, which is 3,300,000 net tons a year. The previous record production was established in October, 1940, when 280,144 net tons were produced.

Award for Ideas to Speed up Defense Program

Revere Copper and Brass, Inc., 230 Park Ave., New York City, is offering an award of $10,000 for descriptions of original or improved products, processes, methods, tools, devices, or ideas (not now in general use) that will help the United States to speed up the Defense Program. The award is open to wage-earners in the metal-working industries, including foremen, sub-foremen, and working men, but is not intended for executives, engineers, laboratory technicians, metallurgists, etc. There will be nine awards consisting of the following amounts: $5000, $2500, $1000, and six awards of $250 each. Entries close on April 30, 1941, and announcement of the men chosen to receive awards will be made on June 1, 1941.

The jury of award will consist of five judges representing science, labor, the Army, the Navy, and industry. The judges are Henry T. Heald, president of the Illinois Institute of Technology; Robert J. Watt, representative of the American workers in the International Labor Organization in Geneva; Joseph Strauss, Admiral U.S.N. (retired), inventor of the turret system of mounting guns on battleships; Frank Parker, General U.S.A. (retired), commander of the First Division of the A.E.F.; and C. Donald Dallas, president of Revere Copper and Brass, Inc. Application blanks and further information can be obtained by addressing the Revere Award Committee, Box 1805, Washington, D. C.

* * *

Over two million pounds of 18-8 stainless steel were used last year by West Coast aircraft manufacturers alone, chiefly for making non-structural parts.

EDITORIAL COMMENT

A recent newspaper article made the statement that "the total expansion of capacity in the machine tool industry is estimated at not much over 50 per cent, and the most optimistic prophets do not promise that the capacity will double until the spring." This is one of those half-truths that are more misleading than a complete misstatement.

Why is the Machine Tool Industry Called a "Bottleneck"?

In the first place, "expansion" may be interpreted in different ways. What American industry is interested in is not so much what has been added in the way of buildings and machines in the machine tool plants, but to what extent the *production capacity* has been increased. In 1929 — a peak year, when deliveries were from six to ten months ahead, so that the industry was working at full production capacity —the machine tool output totalled only $185,000,000. Then came the depression, when production sank in 1932 to a low of $22,000,000. By 1939, the production had reached a new high peak since the last war of $200,000,000. In 1940, the production was well over $400,000,000—not a 50 per cent increase but more than 100 per cent; and every indication points to a production in 1941 of about $750,000,000. These figures on the expansion of the machine tool industry are quite different from those referred to in the newspaper article mentioned.

Production Capacity of Machine Tool Industry Triples in Two Years

As to material expansion—expansion of buildings and equipment—of 115 companies representing 80 per cent of the total machine tool capacity of the country, 65, or more than half, made additions to their plants between August, 1939, and September, 1940; and employment rose from 44,500 in August, 1939, to 69,000 in September, 1940. And here—in the matter of employment—is the crux of the matter. If the machine tool industry had doubled its physical plant capacity, no purpose would have been served as far as production capacity is concerned, because it would have been impossible in the short time available to obtain and train a sufficient number of new employes for the exacting work of this industry.

Let us quote a specific example. One of the well-known companies in the machine tool field now employs 1200 men on two 12-hour shifts. Obviously, that company would much rather employ 1800 men on three 8-hour shifts, because that would save the company a considerable amount in over-time wages; but it has been impossible to find and train the 600 additional men necessary. In fact, even if they could have been brought from other localities into the comparatively small city in which this plant is located, it would not have been possible to find homes and living facilities for these men and their families.

Noteworthy Achievement of Private Initiative and Management

Hence, the problem of increasing machine tool building capacity is not so simple as merely building additional plants. Furthermore, additional plants for the manufacture of machine tools require a larger number of machine tools; and if the machine tool builders were to greatly increase their physical plants, it would simply mean that for the time being, they would require the very machine tools that are now so urgently needed by the armament plants; because the more the physical capacity of the machine tool industry is increased at the present time, the longer will be the delay in deliveries of equipment to the war industries.

The problem is a complicated one; it cannot be stated in a few sentences or explained to the layman in a single newspaper article. But these facts are clear: An industry that has increased its productive capacity from $200,000,000 in 1939 to over $400,000,000 in 1940, with prospects of increasing it to, say, $750,000,000 in 1941 is not a "bottleneck" in the sense in which this word is too frequently and thoughtlessly used. On the contrary, this industry, because of its capable individual management, where free rein has been given to our heritage of free enterprise and initiative, has done a most remarkable job. There is no other industry of the same proportions that has been capable of such expansion and contraction, and has yet proved itself able to fill its place in the economic system. The demand on this industry shrank from 1929 to 1932 to one-eighth of its former value. Today its output is over twenty times greater than it was eight years ago, and in another year it will be almost thirty-five times greater.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Intermittent Rotating Mechanism Designed for Smooth Operation

By L. KASPER

The twisting spindle of a machine for fabricating a twisted wire product was required to finish its cycle in approximately half the time needed for the complete cycle of operations performed by the machine, and then to rest while the remaining portion of the cycle took place. Owing to space limitations, a mutilated gear was selected as the simplest means for producing the required movement. As the driven spindle was required to be positively locked during its rest period, a locking arrangement was attached to the gears; but, on trial, it was found that although the driven spindle rotated at comparatively low speed, the momentum, due to the weight of the rotating parts, was sufficient to produce a severe hammering effect at the end of the rotating period. The design that finally proved satisfactory is shown by the diagrams Figs. 1 and 2.

The plan view, Fig. 1, shows the mechanism shortly before the termination of the rotating period of the driven spindle *D*. Driving shaft *A* carries the mutilated gear *B*, which rotates in the direction indicated by the arrow. Spindle shaft *D*, rotating in the opposite direction, carries the full gear *C* which meshes with gear *B*. Gear *B* carries plate *E*, which is somewhat larger in diameter than gear *B* and is so located that it covers approximately the section of gear *B* from which the teeth have been removed.

Gear *C* carries, on plate *F*, two extensions which are shaped to an arc, the radius of which is a few thousandths of an inch greater than the radius of plate *E*. The number of teeth in gear *B* is sufficient to produce a complete revolution of gear *C*. As gear *C* completes its rotation, the projecting ends of plate *F* come in contact with plate *E* on gear *B*,

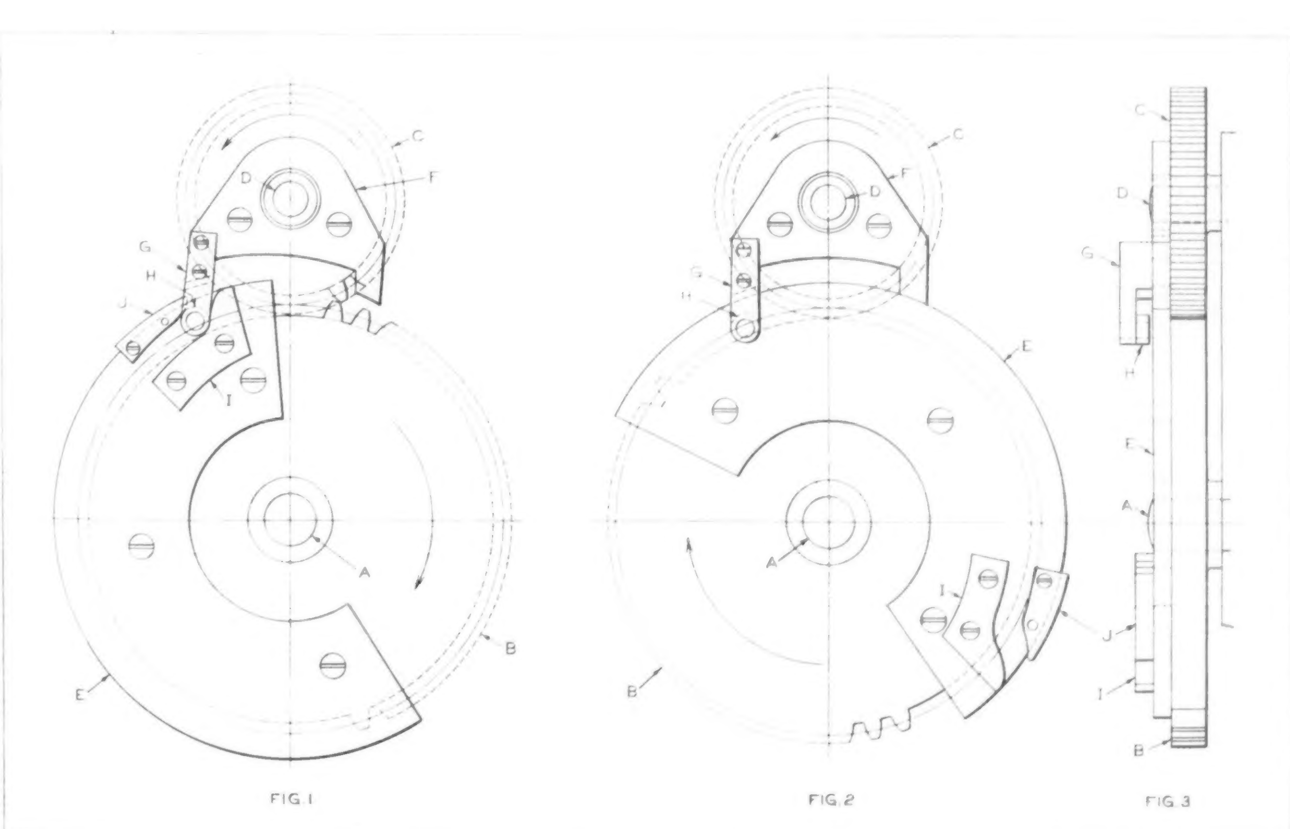


Fig. 1. Intermittent Rotating Mechanism with Driven Gear C about to Begin Dwell Period. Fig. 2. Mechanism Shown in Fig. 1 with Driven Gear C Locked against Rotation. Fig. 3. Side View of Mechanism Shown in Fig. 2

locking gear C against accidental rotation during the rest period. This arrangement constituted the original mechanism.

The objection to this design was that the extension on the left side of plate F struck plate E a heavy blow as gear C and the parts carried on shaft D were brought to rest. In order to eliminate the shock incident to the sudden stopping of gear C, a tooth was removed from the trailing end of gear B. Guide plates I and J were attached to plate E and a roller H, carried on arm G, was attached to plate F in position to follow the cam path between plates I and J.

The last tooth of gear B is shown in Fig. 1 just about to terminate its contact with its mating tooth in gear C. Roller H has traveled downward into the groove formed between plates I and J. Up to this point, roller H travels in the path and at the speed determined by the rotation of gear C, the upper portion of the groove between plates I and J being shaped to conform to this path.

As the last tooth of the tooth section of gear B passes out of contact with its mating tooth in gear C, the latter gear no longer receives driving motion from gear B. The cam groove formed by plates I and J is so shaped that continued rotation of gear B draws roller H toward the center of gear B, causing the rotation of gear C to be continued in its original direction, but at a much slower rate. As roller H reaches the end of the groove, the leading end of plate E comes in contact with the right-hand foot of plate F, locking gear C against accidental rotation. The reduced speed of gear C toward the end of its period of rotation serves to eliminate the objectionable hammering effect.

The method of locking gear C against rotation during its rest period is shown in the diagram Fig. 2. A side view of the assembled mechanism is shown in Fig. 3.

Disk-Feeding Mechanism with Vibrating Attachment Designed to Prevent Jamming

By VINCENT WAITKUS

The mechanism shown in the accompanying illustration was designed to deliver disks W, such as shown in Figs. 5 and 6, from one machine to another in a single continuous stream. It will be noted that the peripheries of these disks are knurled or fluted. As originally constructed, the feeding mechanism consisted primarily of the rotating disk A, Figs. 2 and 3, driven by a V-belt on pulley B; stationary housing C with a grease cup at T, Fig. 2, for lubricating the plain and thrust bearings for the pulley and disk shaft; ring cover D; a guard E, designed to prevent the work from being thrown off disk A by centrifugal force; and a rib F for guiding a single row of disks around its outer edge from the entering end G (see Figs. 1 and 4) to the exit at H.

When the disks leaving one machine were dropped inside guard E and on revolving disk A of the feeding mechanism, they were thrown outward by centrifugal force against the housing C and under cover D. This action served to arrange the work in several rows on the right-hand side of disk A where there is no guiding rib F. When the row of knurled disks close to the wall of housing C reached the throat G formed by the guide rib F, the pressure of the second and third row of disks on the first row, arranged as shown in Fig. 4, often became so severe that the flow of disks from the feeder was interrupted by the jamming of a disk against end K of rib F. It was to remedy this difficulty that the vibrator mechanism shown in Figs. 1, 2, and 3 was devised.

The first step in applying the vibrator was to turn a groove J in disk A to a depth L. The vibrator M was then pivotally mounted on stud N, so that its lower end extended nearly to the bottom of groove J. The vibrator was passed through a loosely fitting hole O in plunger P, which was backed up by spring Q.

A nut R is provided on plunger P for adjusting the stroke of vibrator M. Four equally spaced studs S, set in groove J, come in contact with the end of vibrator M successively when disk A is revolved, and serve to draw back the end of the vibrator against the tension exerted by spring Q. As each stud passes beyond the vibrator, it allows the end of the latter member to spring back with sufficient force to dislodge any disks that may be jammed against end K of rib F.

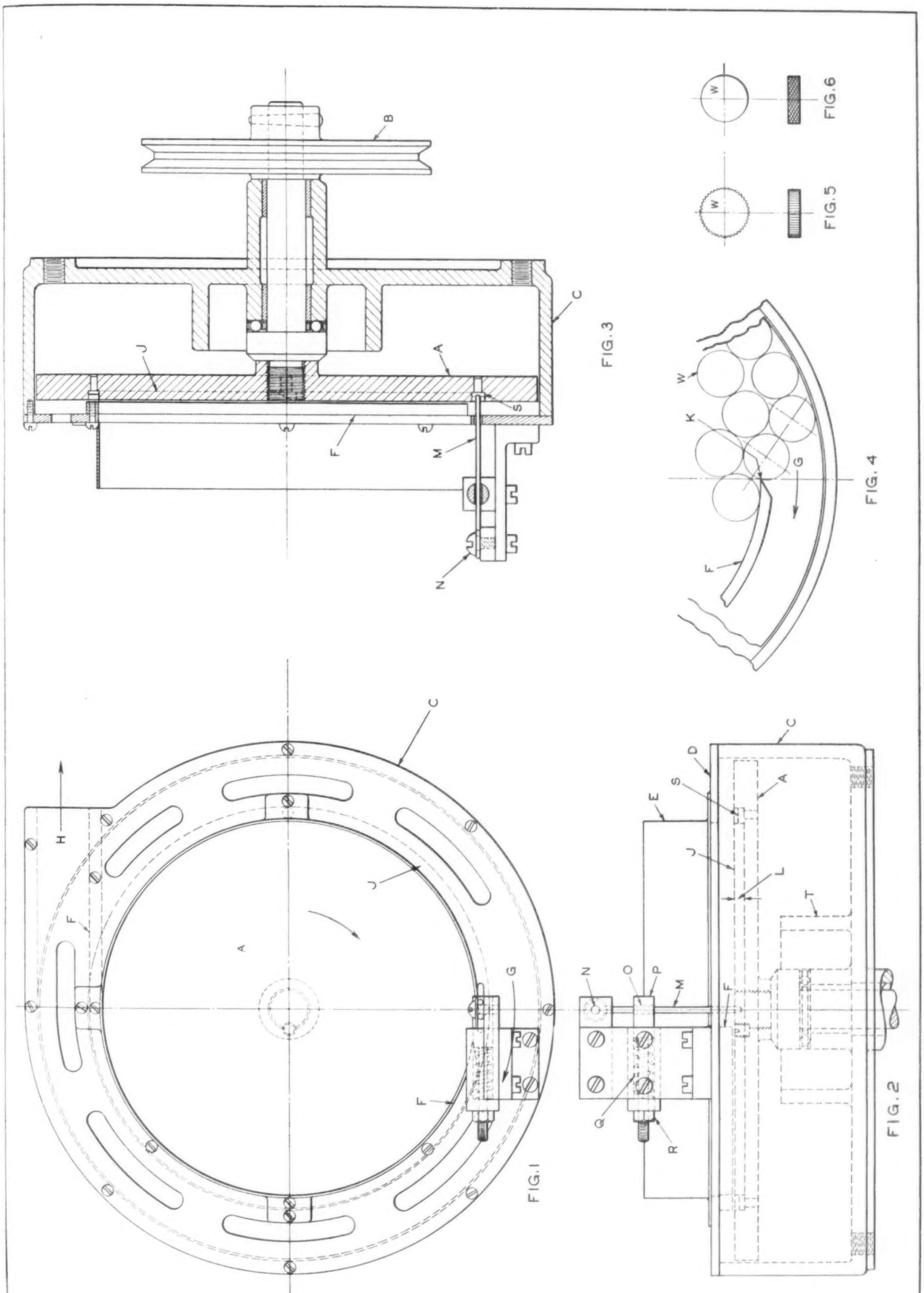
* * *

Defense Industries Need the Services of Young Engineers

In a recent address on National Defense, William A. Hanley, president of the American Society of Mechanical Engineers, made a suggestion for accelerating the education and graduation of the engineering class of 1942. He mentioned that 14,000 young engineers will graduate in the United States in 1941, but many more will be needed. To meet this shortage, he suggested that the engineering schools continue their courses throughout the summer months with intensive study, so that the class of 1942 could graduate in February of that year. According to his statement, one industrial corporation alone is now planning to take on 1400 young engineering graduates before July of this year.

* * *

There has been an increased use of quenched and tempered nickel-chromium-molybdenum and nickel-molybdenum steels for locomotive rods, pistons, axles, and other forged parts to reduce fatigue failures and save weight. A majority of the locomotives built during 1940 were equipped with nickel-steel boilers, firebox plates, and rivets.



Mechanism that Receives Pieces W on Revolving Disk A and Feeds Them in a Continuous Stream to a Machine through an Opening at H

Engineering News Flashes

New Magnet-Wire Insulation Tester Demonstrated

A new portable device for testing the physical toughness of magnet-wire insulating film was recently demonstrated by J. A. Weh, of the General Electric general engineering laboratory, before a committee of the Magnet-Wire Section of the National Electrical Manufacturers Association. The insulation of magnet wire is subjected to a "repeated scrape abrasion test" by the new instrument, which utilizes a needle to wear through the wire insulation to the metal underneath. Contact of needle and wire closes an electric circuit and the device stops automatically, thus making the duration of the test independent of the operator's judgment.

In previous tests of this character, the wire was either pulled under a scrape edge or rubbed by an abrasion drum. In the latter case, it was difficult to maintain a constant abrading surface, and the former method gave inconsistent results with the new tough films, due to alternate gouging and skipping.

The "repeated scrape abrasion test" combines the major advantages of both the former tests. A needle of the ordinary sewing type is used, and its side is held firmly against the wire by small weights while it is driven back and forth by an eccentric mechanism connected with a counter to record the number of scrapes. An electric motor furnishes the power. Only a few inches of wire are required, and the wire can be rotated and shifted so that film toughness may be tested both along and around it.

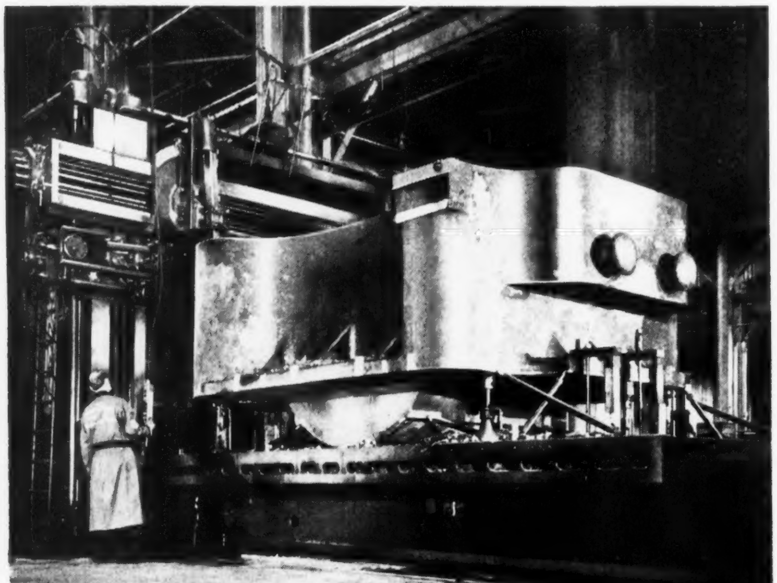
While designed primarily for new insulations of the Formvar type, the instrument can be used to study any kind of enamel or film used on wire, so that it can be applied to a large proportion of the wire used in the electrical industry.

The Chronoscope Measures One-Thousandth of a Second

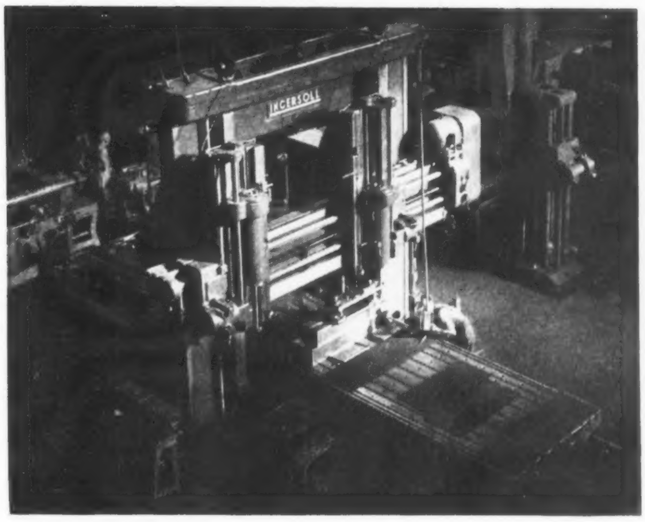
Fractions of a second can now be measured as easily as minutes are measured with a watch. The Research Division of the Remington Arms Co. has developed a device known as a chronoscope, by means of which thousandths of a second can be measured with less than 1 per cent error. This device, which is built into a small portable cabinet, has a capacity for measuring from 0.001 to 0.200 second.

The chronoscope is being used for studying the effect of velocity and flight time of bullets on accuracy, range, trajectory, and hitting power; but its use is not confined to work of this character. Any operations in science and industry that are performed at a very rapid rate can be clocked with a chronoscope, provided that an electrical impulse can be obtained at the beginning and at the end of the measured interval. An indicating needle moving across a scale shows precisely how long it takes a fuse to blow out, a photoflash bulb to light up, a telephone relay switch to snap, or a blasting cap to go off.

Projectile velocities can be measured over distances as short as from 5 to 10 feet. The actual



A Huge Casting—the Bed for a 5000-ton Hydraulic Press—being Machined in the New Plant of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This Casting Weighs 142,000 Pounds



This Giant Ingersoll Machine is, Practically Speaking, a Huge Tool-room Precision Drilling Machine, Employed in the River Rouge Plant of the Ford Motor Co. The Purpose of the Machine is the Drilling of Holes in the Immense Dies Used to Form Automobile Bodies. These Dies Must be Made with Great Accuracy, and Extremely Close Limits are Specified for the Spacing and Bores of the Holes in the Dies

velocity of a projectile at 100 and 500 yards can be measured separately over a distance of 10 feet. To make such measurements has involved the use of very cumbersome methods in the past.

"Listening Laboratory" Described as Quietest Place in the World

A new soundproof "listening laboratory" has just been completed at the East Springfield plant of the Westinghouse Electric & Mfg. Co. This new laboratory is used as a sound inspection chamber for refrigerator units. The chamber is not completely sealed from the outside when in operation, but its construction resembles a labyrinth or maze, consisting of a series of winding passages with 90- and 180-degree turns. In about the middle of these passageways is the actual soundproof chamber. It is a 21,000-pound "floating room," completely hung in the air and supported by twenty steel springs. Thus it is free from any plant floor vibration, which, in itself, is a source of noise.

The walls of this floating room are 1 foot thick, and are composed of eight layers of concrete, tile, dead air space, rock wool, and airplane type felt. The labyrinth walls are 6 inches thick, made of concrete with a sound absorbing surface. It is the labyrinth passages that exclude most of the sound. To further increase the quietness of the laboratory, however, soft padding on the inside of the room and passageways absorbs such noises as would otherwise strike the hard concrete surfaces.

The refrigerator motors and compressor units to be inspected for noise in the "listening laboratory" are carried through the labyrinth structure on an endless conveyor chain. Men especially chosen for exceptional hearing ability act as inspectors. It has been found that the human ear is a better inspection medium than sound meters on this type of work. The inspectors, due to their acute hearing and to the extreme silence of the room, can detect extremely small variations in the sound produced by the operation of a refrigerator motor.

Photo-Sensitized Metal Sheet for Drawings and Photographs

A new photographically sensitized aluminum sheet that can be used for the reproduction of working drawings or photographs has been developed by Republic Engineering Products, Inc., 480 Lexington Ave., New York City. Copies can be made by the usual contact printing method or by an enlarger, and no special treatment or expensive equipment is necessary for processing. The manufacturer recommends the usual steps of development and fixation, but because of the slow speed of the sensitized metal, no special dark-room is needed.

Among the various uses for which the sensitized aluminum sheet is recommended are exact scale copies of drawings, photographs, and instruction sheets, as well as nameplates and templets. Confidential drawings can be placed on large thick sheets of this metal, so that they cannot be removed from the plant without detection. As a permanent record, it has the advantage of withstanding high temperatures, and can be made moisture-proof. A metal sheet of this kind will also withstand rough usage in shop or field without tearing or obliteration of dimensions.

A Rivet Sorter that Performs an Unusual Job Automatically

An unusual rivet sorter has been developed by the Glenn L. Martin Co., of Baltimore, Md., well-known builder of aircraft. This machine takes the accumulation of rivets swept daily from the factory floors and separates them according to diameters, head shapes, and shank lengths. It operates at a high speed and sorts the rivets in a fraction of the time required for hand sorting. These Martin rivet sorters will soon be on the market, the Martin company having licensed the firm of Andrews & Perillo, Inc., Long Island City, N. Y., to manufacture and market them.

Speeding up for Defense in the Aircraft Industry

By H. E. LINSLEY, Engineer
Wright Aeronautical Corporation
Paterson, N. J.

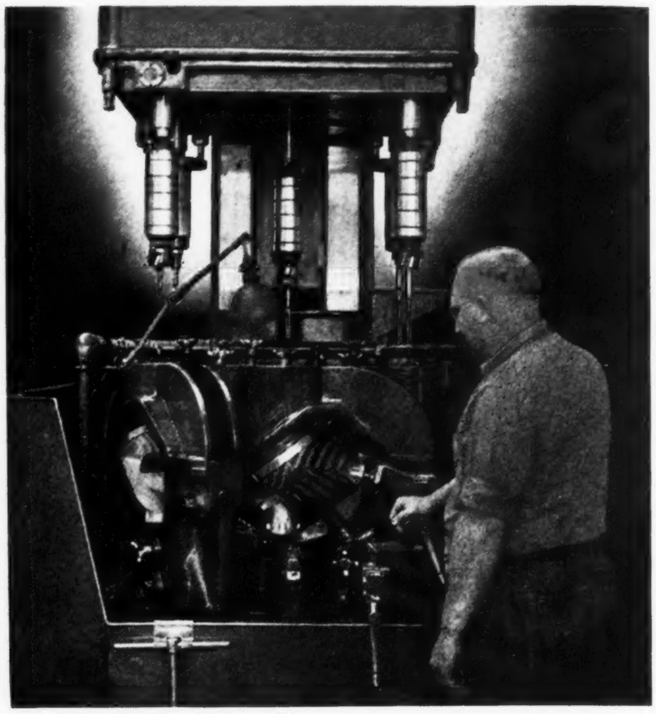


Fig. 1. Six-station, Five-spindle Machine Used for Machining the Valve-guide Holes and Valve-seat Counterbores in Airplane Engine Cylinder Heads

THE needs of national defense have resulted in the increasing use of automatic multiple-spindle equipment in the aircraft industry. New equipment of this classification recently installed in the plant of the Wright Aeronautical Corporation, Paterson, N. J., for increasing the production of cylinder heads is described in this article.

A six-station, five-spindle Natco drilling machine used for performing operations on the valve-guide holes and valve-seat counterbores is illustrated in Fig. 1. The first spindle of this machine rough-drills the valve-guide holes and counterbores the valve seats; the second spindle redrills the valve-guide holes; the third spindle semi-finishes the counterbores; the fourth spindle semi-finish-reams and chamfers the valve-guide holes; and the fifth spindle finish-reams the guide holes and finish-counterbores the valve seats.

All tools on this machine are carbide-tipped, and the holes are held to specified diameters within a tolerance of plus or minus 0.0005 inch. The exhaust holes have a specified diameter of 0.875 inch and are 1.960 inches long, the intake holes being 0.687 inch in diameter by 1.260 inches in length. The counterbores are machined to a diameter of between 3.3115 and 3.3135 inches, and to depths of 0.561 and 0.612 inch on the intake and exhaust holes, respectively, of the cylinder heads.

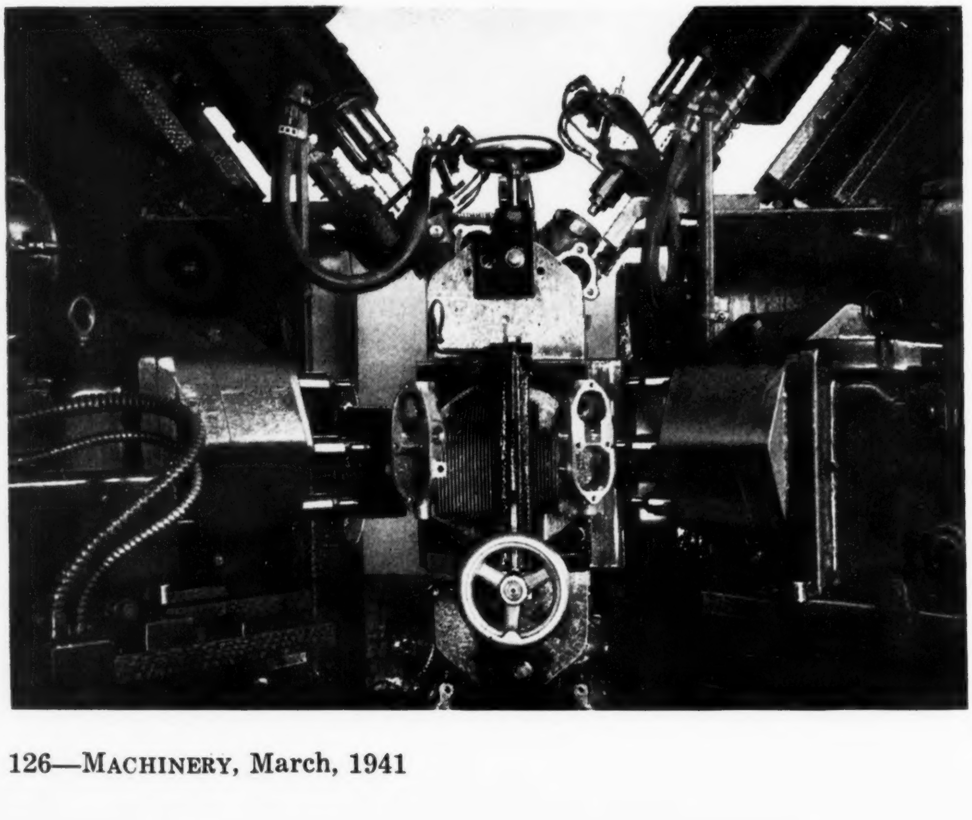


Fig. 2. Hydraulically Actuated Machine Equipped with Six Tool-heads and an Indexing Fixture for Drilling, Countersinking, and Tapping Four Holes in the Two Rocker Boxes of the Cylinder Heads

The clamps that secure the cylinder heads in the fixtures are tightened by means of cranks attached to the front of the machine. Safety switches prevent operation of the machine until these cranks have been fully disengaged from the fixture that happens to be opposite to them.

An automatic, hydraulically actuated machine used for drilling, countersinking, and tapping four holes in each of the two rocker boxes of the cylinder heads is illustrated in Fig. 2. The cylinder heads are loaded in the four-station fixture at the front of the machine and indexed in a vertical plane to the various tool-heads. The two upper heads drill the holes, the two rear heads countersink them, and the two lower heads tap them. The holes are drilled with a letter F drill and tapped to a diameter of 5/16 inch with eighteen threads per inch of U. S. form. The depth of the tapped hole is 0.900 inch.

The work fixture is indexed manually, an automatic interlock being provided to prevent indexing while the machine is in operation. The tool-heads are advanced rapidly to the work, and are withdrawn rapidly at the end of their forward movements. This machine was built by the Barnes Drill Co., Rockford, Ill.

A Natco two-way drilling machine built with two tool-heads on angular slides for simultaneously forming the countersink and three concentric counterbores for both the intake and exhaust valve springs is shown in Fig. 3. For this operation, the cylinder head is located by hardened steel plugs on the fixture which engage both valve-guide holes. These plugs are connected to safety switches in such a manner that the machine cannot be started until the plugs are fully engaged in the locating holes. Carbide-tipped tools are employed on this machine to obtain high speeds and a fine finish.

Making a Spot Weld without Leaving a Conspicuous Mark

By HAROLD J. FAIRCHILD

Making good spot-welds without leaving a conspicuous mark on the product has been found to be quite a problem. The automobile industry has solved this by welding through an auxiliary piece of copper, the copper plate being used as a clamping member, or as a part of the fixture.

In the manufacturing plant with which the writer is connected there is an important welding job that has caused considerable trouble for years, as the part welded is in a conspicuous location in the finished product. After welding, the surface must also be polished and plated. A spot welder of well-known make is being used, but even the assistance of the builder's engineers proved of no avail in this matter. It seemed impossible to make a good weld without leaving a serious mark.

After a great deal of experimentation, a method was discovered that gave satisfactory results. Thousands of pieces have now been welded in accordance with this method, all of them having a surface free from any conspicuous or damaging marks. One swipe of the polishing wheel makes the surface look like a mirror.

The method is briefly as follows: The bottom electrode, larger in diameter than the conventional type, is made with a concave surface, the depth of the concavity being from 0.005 to 0.007 inch. The parts to be welded are placed on the bottom electrode, with the important surface down.

Tests, as well as practical results, have conclusively proved that this method will give the desired results—a smooth surface, free from burns, indentations, or high spots.

Fig. 3. Two-way Angular Type of Machine Designed for Simultaneously Forming a Countersink and Three Concentric Counterbores in the Cylinder Heads to Receive the Intake and Exhaust Valve Springs

Modern Abrasives Celebrate Their Fiftieth Anniversary

A Brief History of the Discovery and Development of Industrial Abrasives, Commemorating the Discovery of Silicon Carbide in March, 1891

By FRANCIS D. BOWMAN
The Carborundum Co.
Niagara Falls, N. Y.

Dr. Acheson Working at His Second Furnace, which was Built of Brick. The Power was Carried to His Mixture through Electrodes Set in the Side of the Furnace

IN March, 1891, Edward G. Acheson discovered and made a new chemical compound, silicon carbide—a substance not found in Nature. It is safe to say that this achievement has made possible greater advances in the use of abrasives in the last fifty years than in all the preceding centuries.

As a matter of fact, the last fifty years have brought greater advances in industry, and consequently in the comforts of living, than all previous eras of human effort. Research has given us countless new materials, devices for making life easier and pleasanter, cheap and rapid transportation, electricity cheaply and abundantly produced, and marvels of communication such as the telephone, radio, and television.

All this has been made possible by the machine tools and other machinery used by industry; but it is safe to say that without the modern manufactured abrasives many of the advances of the last fifty years would have been retarded or impossible of achievement. It is difficult to think of a single product in any industry in the manufacture of which man-made abrasives do not play an important part. That they are one of the principal factors in mass production is doubtless realized by all engaged in the metal-working industries.

Early Uses of Abrasives

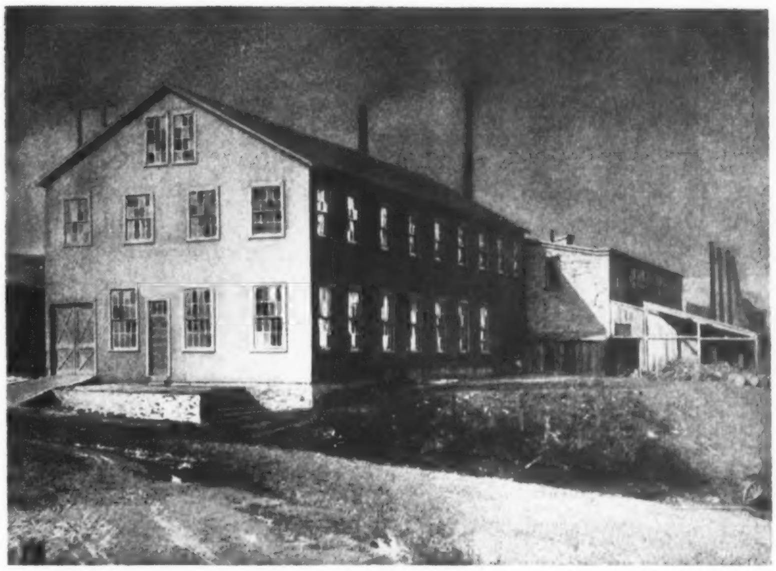
Archeological evidence shows that abrasives were used for shaping and sharpening implements of horn and bone at least 15,000, or perhaps 25,000 years ago. There are not many records of the use of abrasives in the period from 2100 to 30 B.C., probably because the then known abrasives could not be used to sharpen copper and bronze. The earliest records of the use of abrasives for sharpening iron are from the period of 1550 to 1100 B.C. A dagger of this period was found beside a fine-grained sandstone in Egypt.

The first writer to mention emery with any degree of certainty was Pliny in the first century A.D. Gem polishing goes back to the sixth century B.C., but the actual cutting of gems did not come until 2000 years later. In 1327 A.D., factories near Leichlinge were equipped with water-wheel driven grinding wheels for sharpening knives. Leonardo da Vinci contributed much to the abrasive art. He invented a needle-sharpening machine which he estimated would produce 40,000 needles per hour. There are no records as to whether he actually attained that production. He also designed other grinding machines.

By the sixteenth century, emery was in general use. Abrasive paper for polishing iron and steel was being sold in Paris in 1769, and in 1831 emery cloth was developed. So far as is known, the first word about man-made grinding wheels came to Europe in 1825, when it was reported that a Hindu people of high culture was making a corundum wheel bonded with gum resin.

By the middle of the ninteenth century, manufactured wheels with various bonds had become quite common. The bonds used at first were sodium silicate and ceramic clays. In 1857, a rubber-bonded wheel was patented. But all these wheels used natural emery or corundum, both of which contained undesirable impurities and were not uniform in composition, nor, hence, in performance. The manufacture of corundum was first undertaken in 1837, although not on a commercial scale.

How Edward G. Acheson discovered silicon carbide, how he developed its manufacture on a commercial basis, and how he overcame the early prejudices against it is a human interest story of the first rank. In the middle eighties, he was making some experiments with gas-fired furnaces for the reduction of iron ore. In one of these experiments, he noticed that clay articles fired with natural gas became thoroughly impregnated with carbon and that they seemed harder than when the carbon was not present. He did not at once follow up this discovery; but early in 1891, he decided to experiment with the impregnation of clay with carbon in an electric furnace. In his autobiography, he describes this experiment as follows:

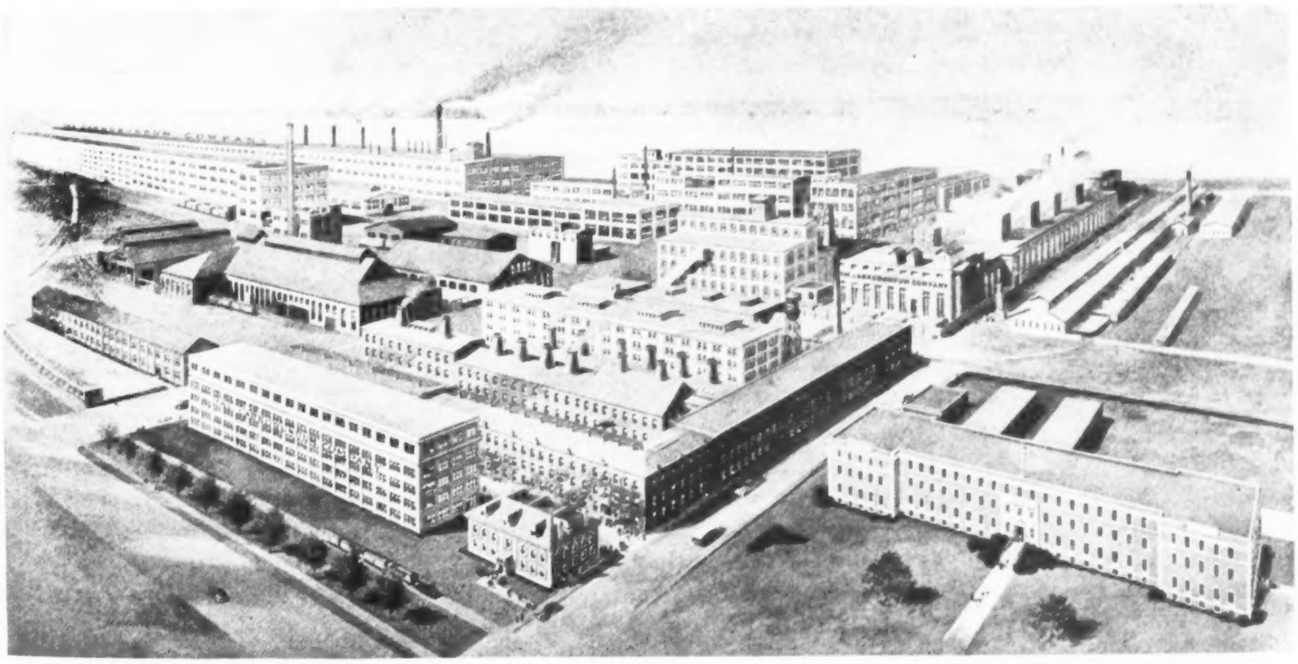


The First Plant of The Carborundum Co. was Located at Monongahela City, Pa. It was in This Building that Dr. Acheson Produced the First Man-made Abrasive

"An iron bowl, such as plumbers use for holding their melted solder, was attached to one lead from a dynamo and filled with a mixture of clay and powdered coke; the end of an arc-light carbon attached to the other lead was inserted into the mixture. The percentage of coke was high enough to carry a current, and a good strong one was passed through the mixture between the lamp carbon and bowl until the clay in the center was melted and heated to a very high temperature. When cold, the mass was examined. It did not fill my expectations; but I, by sheer chance, happened to notice a few bright specks on the end of the arc carbon that had been in the mixture. I placed one on the end of a lead pencil and drew it across a pane of glass. It cut the glass like a diamond. I repeated the experiment and collected enough of the material to test its abrasive qualities. I mounted an iron disk in a lathe, and, oiling its surface, applied the material, which adhered, and with this revolving disk I cut the polished face of the diamond in a finger ring still owned and worn by me.

"I now made a small furnace of bricks; and after much and patient work, had what I considered enough to take to the lapidaries in New York City."

Acheson and a friend started for New York to interview the gem-cutters. On the way, they discussed various names for this new material. It had not then been chemically analyzed, but Acheson



The Plant of The Carborundum Co. at Niagara Falls, N. Y., as It Appears Today, Fifty Years after the Development of Manufactured Abrasives

was under the impression that it was composed of carbon and corundum, so he coined the name "Carborundum." Later, chemical analysis showed that the material was silicon carbide, a heretofore unknown chemical compound. The name "Carborundum" was subsequently applied as a trademark to products of The Carborundum Co., which was organized to commercially develop Acheson's discovery.

A diamond-cutter on John St. used some of the product to repolish the diamond Acheson had ground, and bought the remainder from him at 40 cents a carat, or $880 a pound. With the proceeds, Acheson purchased a microscope to help him study the structure of the new material.

Acheson continues in his autobiography: "A great deal of time and energy were expended in an effort to develop a trade with the lapidaries, but the consumption of abrasives in this line was small and mainly covered by the refuse matter from diamond cuttings and chippings. I gradually increased the size of my furnace and sent samples to various emery-wheel manufacturers to be made into small wheels. Without exception, these companies reported that it was not possible to make the material up into successful wheels. Not discouraged, I undertook experiments on these lines."

One of the first large orders Acheson got for wheels was from George Westinghouse. He made, with his own hands, some 60,000 small wheels on this order and received over $7000 for them.

Corundum Manufactured in the Electric Furnace

Prior to Acheson's discovery of silicon carbide, the principal commercial abrasives had been natural aluminum oxide in the form of corundum, and emery, which is a natural mixture of corundum with impurities, the chief of which is iron oxide—a substance which in itself has some abrasive qualities. Stimulated by the discovery of silicon carbide, Charles B. Jacobs carried on research into the manufacture of other abrasives. In 1899, he succeeded in making crystalline aluminum oxide (corundum) on a commercial scale in the electric furnace. He used bauxite (aluminum hydroxide) which he first calcined to remove the water.

Heated in the electric furnace with other substances to remove impurities, the aluminum oxide is converted into crystalline form. It is similar in chemical composition to the ruby and sapphire and is crystallographically the same as natural corundum.

Manufactured aluminum oxide, however, is composed of more perfectly formed crystal units than corundum, and the units are interlocked into a continuous fused composition. These differences give a harder and tougher abrasive and the uniformity that is essential in modern grinding.

It would be hard to exaggerate the economic significance of manufactured abrasives in the metal-working industries. Grindstones and emery wheels would sharpen tools of the steels available fifty years ago after a fashion, but they would not give a keen edge to the harder, high-speed tools that are essential to modern production. The natural wheels had no uses as production tools for the removal of stock, for they were neither hard enough nor uniform enough. Their function was to polish surfaces that had been previously prepared by the lathe, planer, shaper, or milling machine. In a large number of operations, modern manufactured abrasives are effective and efficient material-removing tools. Hardened steels that cannot be cut by any other method are readily brought to size and shape by grinding. This has made possible the use of hardened steels for crankpins, spindles, and other wearing parts.

The great accuracy of grinding made possible the achievement of interchangeable parts in large quantities at low cost. The close accuracy and smooth finish of ground and lapped or honed bearing parts eliminate the need for the wasteful "running-in" period, which was essentially a subsequent finishing operation on a machine that was presumably already "finished."

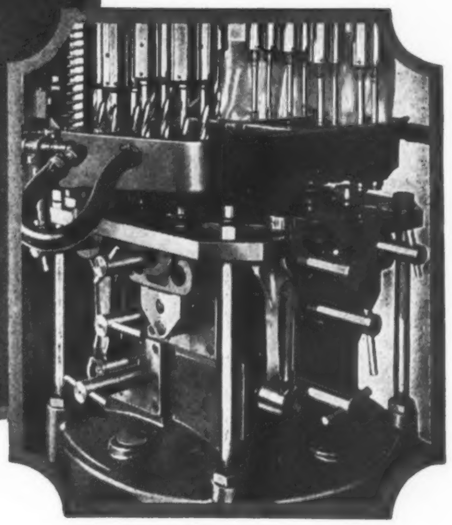
The ability to finish-grind rolls to a surface perfection of within three- or four-millionths inch has made possible the production of steel sheets and strip of better quality at lower cost. Formerly, if a fine appearing surface was required, it was necessary to polish the sheets after rolling. This was not only an expensive operation, but the surface, while bright and shiny, was actually not so smooth as that now produced directly by rolls.

The great development of the Diesel engine would not have been possible without the accuracy achieved by modern abrasives. Aside from the characteristics essential to all high-speed machinery, consider the vital fuel pump and injector parts alone. They have to be finished to an accuracy of 0.00005 inch, which is accomplished economically by grinding.

The high speed of present-day railroad trains is made possible largely by the accuracy of their parts and freedom from excessive vibration. Car and locomotive wheels are ground to a high degree of truth. Even the rail joints are ground to avoid the vibration and jars that were so unpleasant even in the days of comparatively low speed, and that would be intolerable and dangerous at speeds which are now common.

All of these improvements in quality and reductions in cost have come about in the last fifty years—since the discovery of how to manufacture abrasives of great uniformity on a commercial basis. Not all of the credit should go to abrasives, of course. Better machine tools, better cutting tools, and new metals have all played important parts; but certainly many products in use today could not be manufactured without modern abrasives. They come as close as anything can to being the Keystone of Production.

Design of Tools and Fixtures



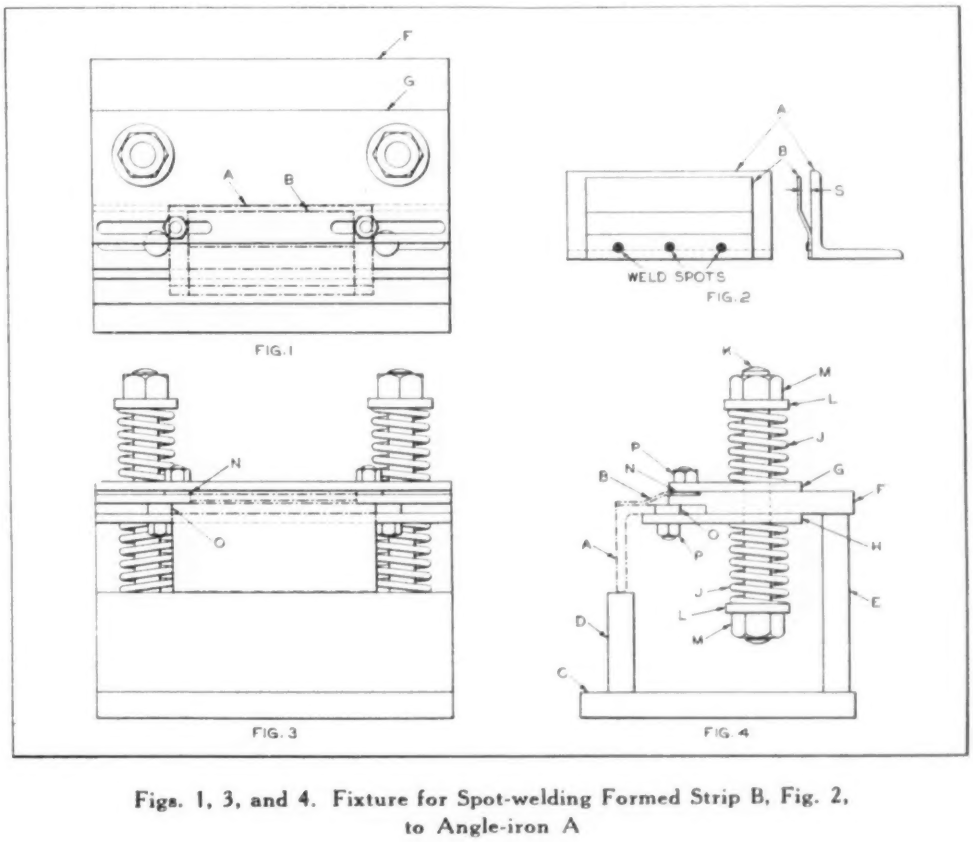
Fixture for Spot-Welding Formed Strip to Angle-Iron

By JOSEPH WAITKUS, Wellsville, N. Y.

The product shown in Fig. 2 of the accompanying illustration consists of an angle-member *A*, to which a formed strip *B* is spot-welded. As the position of the formed strip varies, provision is made in the welding fixture, shown in Figs. 1, 3, and 4, for handling any variation required, as well as the entire range of sizes produced. The fixture is designed to maintain the open space *S* between the angle-member *A* and the strip *B* as nearly uniform as possible.

Base *C* of the fixture supports members *D* and *E*. A plate *F*, fastened to member *E*, is machined along one edge, as indicated, to provide a projection which serves as a spacer between the angle-member *A* and formed strip *B*. Two clamping plates *G* and *H*, held in position by springs *J*, serve to hold the angle-member and the formed strip firmly in position during the welding operation. Studs *K* are fastened to plate *F* and are provided with washers *L* and nuts *M* to retain the springs *J* and permit varying the tension.

To allow adjustment for different lengths of angle-member *A* and formed strip *B* and for variation in their relative positions, adjustable stops *N* and *O* are provided on the clamping bars *G* and *H*. Slots cut in each of the bars accommodate these stops, which are held in place by nuts *P*. Setting the stops in their proper position determines the position of the angle-member and the formed strip, and also serves to check them for length, to insure uniformity in the final assembly. The supporting member *D* serves as a rest for angle-member *A*, and steadies the component parts while the welding operation is being performed.



Figs. 1, 3, and 4. Fixture for Spot-welding Formed Strip B, Fig. 2, to Angle-iron A

With the aid of this fixture, it has been possible to triple the production of a welder and, in addition, the product obtained is more accurate and uniform.

Die for Forming and Piercing Copper Disk

By H. J. HAWK, Time Study and Methods Department
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

A copper disk of the dimensions shown at *A*, Fig. 1, is formed to the shape indicated by the cross-sectional view at *B*, and pierced at the center for a flat-head screw in one operation in the die shown in Fig. 2. The round blank or disk, as cut from sheet material by a blanking die, is placed in the open die, in which it is located by four gage pins *C*, Fig. 2. When the press is tripped and the punch member begins to descend, the outer rim of the copper disk is held firmly between rings *D* and *E*, while the inner rings *F* and *G*, backed up by spring pressure, begin the forming operations. As the die continues to close, the outer rings also begin their forming work on the blank, which is formed to the required shape when the die is completely closed, as shown in Fig. 2.

The die-shoes are made from hot-rolled steel, cut from bar stock and surface-ground on top and bottom. These two plates are assembled in the conventional method with guide or leader pins and bushings. Ring *D* serves three purposes, being used as a gage-plate, pressure ring, and forming ring. It is made of tool steel, and is drilled, tapped, hardened, and ground to the correct size for the required drawing operation. Ring *D* is held to the bottom plate by four shoulder-screws, and is supported in the working position by three light stock springs.

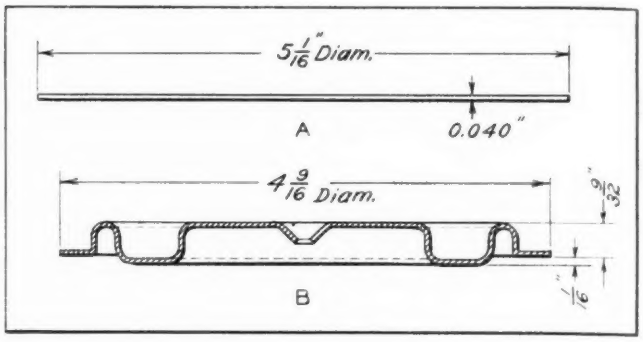


Fig. 1. Copper Disk before and after Forming and Piercing in Die Shown in Fig. 2

The upper pressure and sizing ring *E* is made of hot-rolled steel, and is casehardened. This ring is held to the upper plate by four shoulder-screws *H*, pressure being applied by four light stock compression springs.

The forming rings *F*, *G*, and *R*, and the pressure and sizing ring *K* are made of tool steel, and are machined, hardened, and ground to drawing size. Ring *G* is held to the upper plate by four shoulder-screws *I*, and is supported in a working position by four very strong compression springs *J*. Ring *K* is held to the upper plate by four shoulder-screws. Pressure is exerted on this ring by four light stock compression springs *L*.

The lower forming ring *F* is held to the lower plate by four shoulder-screws *M*. Ring *F* is given a working pressure by spring *N* through four spacer pins *O* that rest on a spring pad *P*. Spring *N* is made of spring steel, 1/2 inch in diameter, and is a stock product. It is held in position by two spring pads, one of which is shown at *P*, and two 1/2-inch bolts *Q*.

The forming ring *R* is fastened to the upper plate by four screws and two dowels *S*. Die part *T* that forms the countersink impression is held in place by ring *F*, and is given some forming pressure by spring *U*.

The piercing punch *V* is held in place by member *T* and kept in working position by spring *W*. Spacer *X* supports the

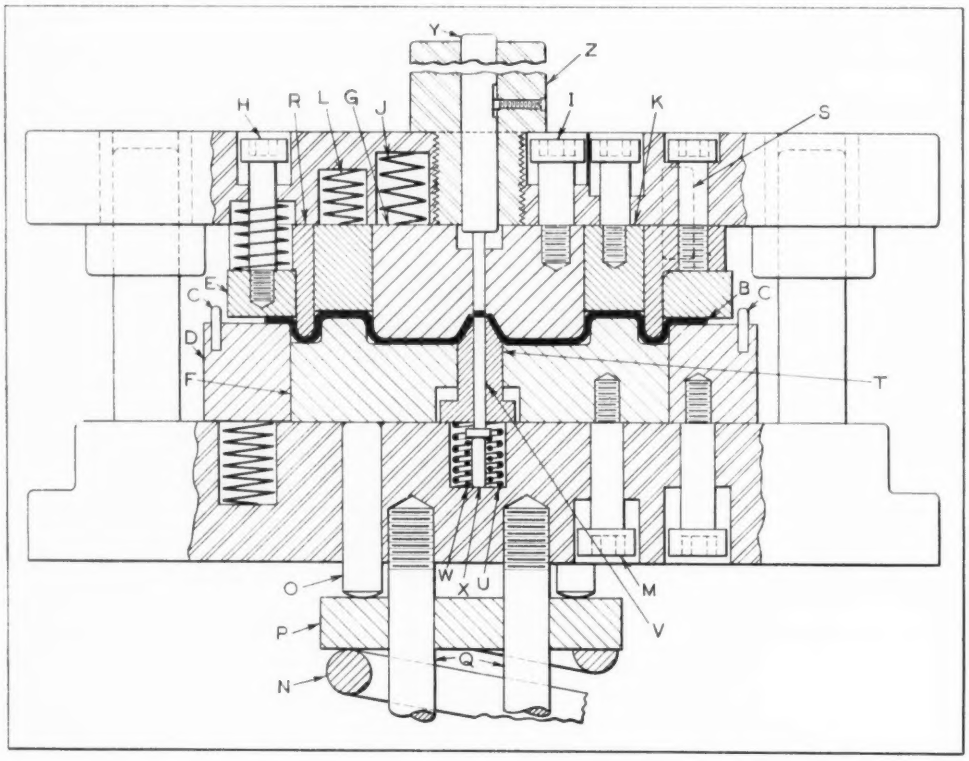


Fig. 2. Forming and Piercing Die in Closed Position with Work Shown at B

piercing punch when the die is closing to pierce the center hole. Spring W holds the punch up and prevents slugs from the pierced center hole from falling into the die hole when the die is open. Stripper Y knocks the slugs from the die. The stem Z is made of cold-rolled steel, and is fitted to the tapped hole in the top plate.

Micrometer Equipment for Measuring Large Lathe Work

By M. JACKER, Oakland, Calif.

The painstaking efforts of a lathe operator in trying to maintain limits of plus or minus 0.0005 inch on a shaft 28 inches in diameter was recently called to the writer's attention. The usual method of stopping the lathe and carefully measuring the work with a huge micrometer to find the over-size spots was being followed. This process of reducing the high spots, stopping the lathe, and again carefully going over the shaft with the micrometer is a tedious job, even when the shaft is comparatively small.

In order to permit accurate measurements of this kind to be taken while the lathe is running, equipment such as shown in Figs. 1 and 2 was designed. This equipment not only enables measurements to be taken on certain spots that happen to be under the measuring points, but it also facilitates exact measurement around the entire circumference of the shaft.

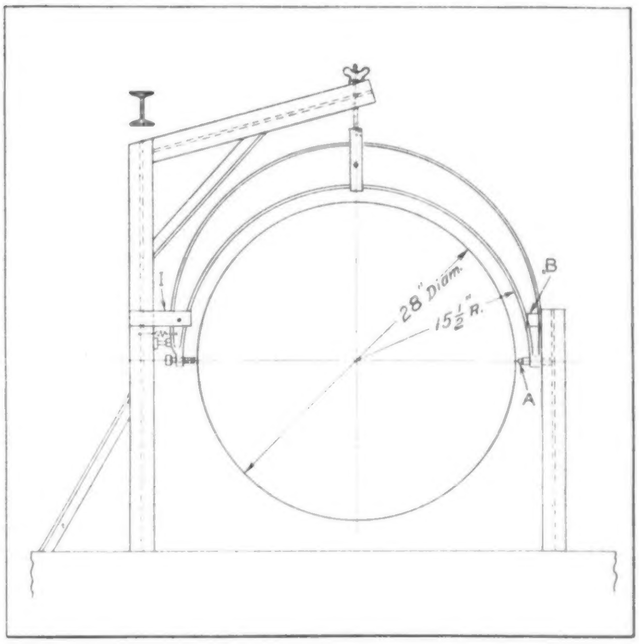


Fig. 1. Micrometer Mounted on Lathe Carriage for Measuring Large Work

It is very important that the shaft being measured be kept thoroughly clean. This can be done by applying a piece of chamois skin that is kept as free from dust as possible. If a coolant or lubricant is used in finishing the shaft, the chamois skin must be frequently washed or rinsed off. The palm of the hand is often used on small shafts to clean the surface before applying the micrometer.

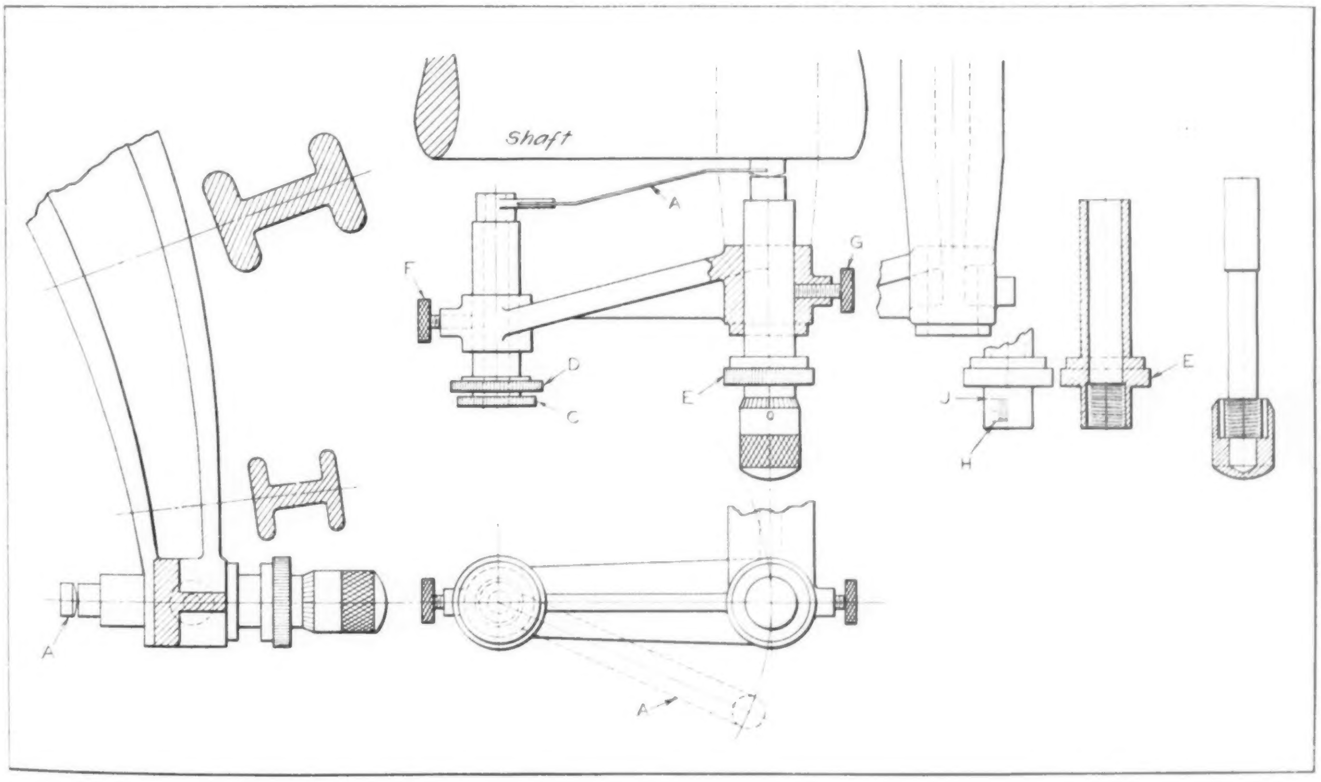


Fig. 2. Detailed Views of the Micrometer Head and Sensitive "Feeler" of the Large Micrometer Illustrated in Fig. 1

In Fig. 1 is shown the huge caliper, hung from a support that is fastened to the rear part of the main lathe carriage and, of course, travels along the shaft at the same speed as the cutting tool. It is important that the caliper be suspended so that its measuring points are in alignment, within 1/16 inch, with a horizontal line that passes through the center of the shaft at right angles to its axis. The longitudinal centering of the measuring points can be done from a line scribed on the circumference of the shaft. The other line that determines the vertical position of the measuring points must be located at the same height as the lathe centers, and must be scribed on both sides of the shaft. Guides *B* and *I*, fastened to the front and rear posts, are arranged to restrict the "float" or movement of the caliper to 1/32 inch from the central position determined by the horizontal and vertical center lines.

At *A*, Fig. 1, is a sensitive "feeler" center, the details of which are shown in Fig. 2. The arm part of the feeler is made from a thin flat spring with a hardened steel button on one end. The feeler arm can be oscillated by the knurled head *C*.

To illustrate the use of this device, let it be assumed that the caliper is to be used in holding the work to limits of plus or minus 0.0005 inch on a shaft 28 inches in diameter. First the caliper is set to a master gage 28 inches in length. Then the micrometer measuring screw is set to its zero division on line *J*, Fig. 2. Next the set-screws *F* and *G* are loosened and the feeler button pushed against the master gage by means of the knurled head *D*. The micrometer head is then moved up by means of the knurled head *E*, so that a slight frictional contact can be felt when oscillating the feeler button between the gage and the micrometer, after which the set-screw *G* is tightened to hold the head *E* in place. The set-screw *F* is likewise tightened to hold the head *D* when the feeler button has been adjusted to bear equally on the master gage and the micrometer.

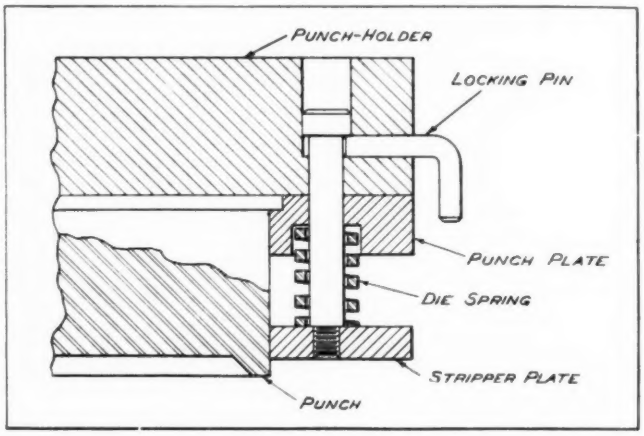
The micrometer screw is next turned back 1/4 inch to register with line *H* on the thimble. The feeler is allowed to drop to a vertical position, and the caliper is then ready to be suspended over the shaft, as shown in Fig. 1. Two or three cuts are usually taken on the shaft, which is within 1/2 inch of its finished size before the final operation. In taking these preliminary cuts, the feeler *A* can be used to assist in holding the work to a uniform diameter throughout its length.

With the measuring equipment described, a very sensitive touch can be employed in making exact measurements, regardless of the weight of the caliper. When the feeler is dropped, a light coil spring fastened to the rear support and the caliper causes the caliper to be drawn to the rear 1/32 inch against a screw-stop in the support, so that both the rear and the front measuring points are clear of the revolving shaft. Only when applying the feeler is there a slight frictional contact with the revolving shaft.

Locking Pin for Die Stripper Plate

By K. N. NICHOLS, Chicago, Ill.

Piercing dies that are mounted on plain punch-holders or die-shoes without leader pins, and are equipped with spring strippers or shedders, must have some means of raising the stripper above the end of the punch, or punches, before the die is set up in a press. While laying out the tools for a recent job requiring a number of such dies, the writer conceived the idea of providing a means for holding up the stripper by drilling a pin-hole



Punch-holder Equipped with Locking Pin for Holding Stripper Plate in "Up" Position

through the punch-holder to accommodate a locking pin, as shown in the accompanying illustration.

The hole was drilled in the holder tangent to the shoulder of the stripper-bolt counterbore. The locking pin could then be inserted when the stripper was raised against the spring pressure, thus locking the stripper clear of the punch end by an amount equal to the diameter of the pin less the distance the stripper extended beyond the punch in its free position.

After completing a job, the die-setter places the locking pin in the die while the press ram is in the lower position, thus locking the stripper in the "up" position, as well as securely holding the locking pin so that it will not be lost. When the die is again brought out for use, the maintenance man does not have to disassemble the die for grinding. In this respect, the arrangement is equally satisfactory for dies with leader pins.

* * *

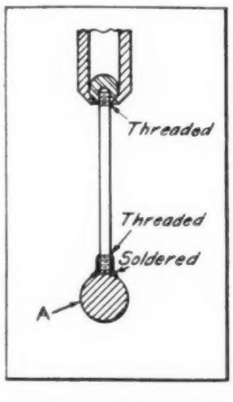
Stimulated by the needs created through the war, an active machine tool industry has been created in Australia. It is stated in a report of the Australian Supply Department that the production of machine tools has now reached the value of $10,000,000 a year. Less than eighteen months ago, there were only four shops in Australia producing machine tools. Now there are ninety.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Work-Locating Tool for Jig Borer

The tool here illustrated was made by the writer to save time in locating work on the jig borer and milling machine. It consists of a regular wiggler, to which a 1/2-inch ball bearing *A* has been soldered. The ball bearing selected for this purpose is accurate within 0.0003 inch.



Device Used in Spindle of Jig Borer for Locating Work

After the work is lined up parallel on the machine table, the wiggler is placed in the spindle chuck, and with the machine running, the work is brought against the ball until the light between the work and ball is shut off. The micrometer gage in the trough is then set, and the end of the work is definitely located 0.250 inch from the center of the spindle.

This operation is repeated for the cross-table of the machine to bring the work into the starting position. The method described is the quickest one the writer has found for "splitting the edge" in locating work, and he prefers the versatile ball wiggler to the lapped cylinder commonly used on jig borers or the V-block and indicator equipment supplied with jig borers.

Washington, D. C. LLOYD J. HERRIMAN

Lapping Gage-Blocks to Obtain Accurate Parallel Sides

As is the case with any accurate shop-made gage, the final finishing of the measuring surfaces of gage-blocks must be done by lapping. In making gage-blocks, it is of the utmost importance that both sides of the blocks be lapped parallel within close limits of accuracy. Gage-blocks can be made most economically in pairs. The material cost is not an important item, and two blocks can be finished almost as cheaply as one. For example, it may be more convenient and economical to make two 0.250-inch blocks to replace a 0.500-inch block.

The chief advantage of making twin blocks is that accurate parallelism is easier to obtain by the method to be outlined. After surface-grinding the gage-blocks to within plus 0.0003 or 0.0004 inch of the required size, one side of each block is finish-lapped by rotary movement on the lapping plate. Two very accurate commercial V-blocks are required for the next step. One side of each V-block is then lapped.

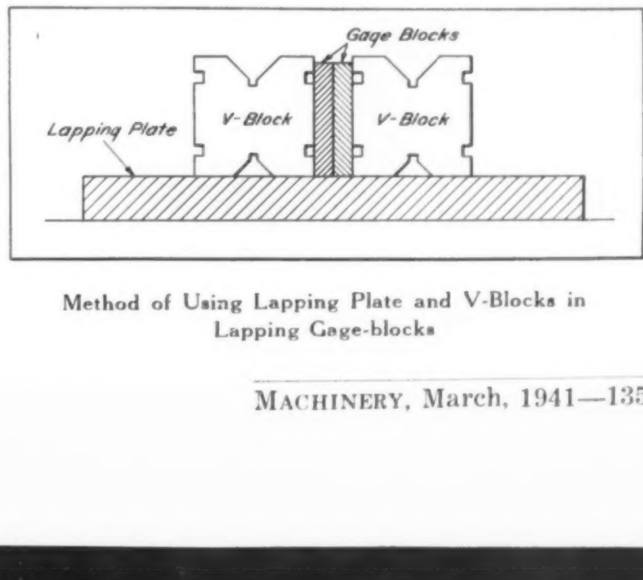
After thoroughly cleaning the lapping plate, it is given a light film of spindle oil. All previously lapped surfaces are also wiped clean. The lapped sides of the gage-blocks are then placed against the lapped sides of the V-blocks. The lapped parts should adhere to each other when "wrung" lightly together.

The V-blocks, with the gage-blocks in place, are then positioned on the lapping plate as shown in the illustration. The contacting sides of the gage-blocks are next rough-lapped by a back-and-forth movement. This motion removes the slight amount of material required to impart precise parallelism to the blocks, assuming that the V-blocks and lapping plate are accurate. The gage-blocks can then be finished to exact thickness by finish-lapping these sides on the lapping plate. A mirror-like finish can be given the blocks without affecting the accuracy by using crocus cloth. Of course, a fine grade of compound should be used for the lapping operations.

Indian Orchard, Mass. THOMAS WILKINSON

* * *

In reviewing the present trends in arc welding, W. W. Reddie, of the Westinghouse Electric & Mfg. Co., says that, while no industry should be complacent about its accomplishments, it may be safely asserted that the welding industry was ready for the Defense Program. This industry stepped up from the requirements of normal operation into a tremendously accelerated production of welding machines and welded products with a minimum of lost time and without confusion.



Method of Using Lapping Plate and V-Blocks in Lapping Gage-blocks

Oil-Well Equipment Built to Drill 15,000 Feet Deep

Operations Performed in a Pacific Coast Plant in Building the Sturdy Machinery Required to Drill to Record Depths—First of Two Articles

By CHARLES O. HERB

MACHINERY for drilling oil wells through thousands of feet of sand, soil, and solid rock must be of rugged construction to withstand the severe duty demanded and to permit fast drilling under adverse conditions. At the same time, close dimensional accuracy is required for many parts, in order to insure trouble-free operation at high speed.

Oil-well drilling equipment used the world over has been built in the Torrance, Calif., plant of The National Supply Co., including the equipment that drilled the deepest oil well in the world. This well, near Bakersfield, Calif., is 15,004 feet deep—almost three miles. Outstanding operations in producing oil-well drilling equipment in the plant mentioned will be described in this article.

Drill collars and grief stems up to 60 feet in length have been bored on a special machine that is capable of handling work 80 feet long. This machine, shown in Fig. 1, has a stationary bed at the right-hand end which is equipped with a headstock for supporting one end of the work and for driving and feeding a long boring-bar through the headstock and the work. The rear end of the boring-bar is supported on a carriage that runs on tracks embedded in the floor.

The left-hand end of the drill collar or grief stem is supported in a chuck mounted on a long bedlike

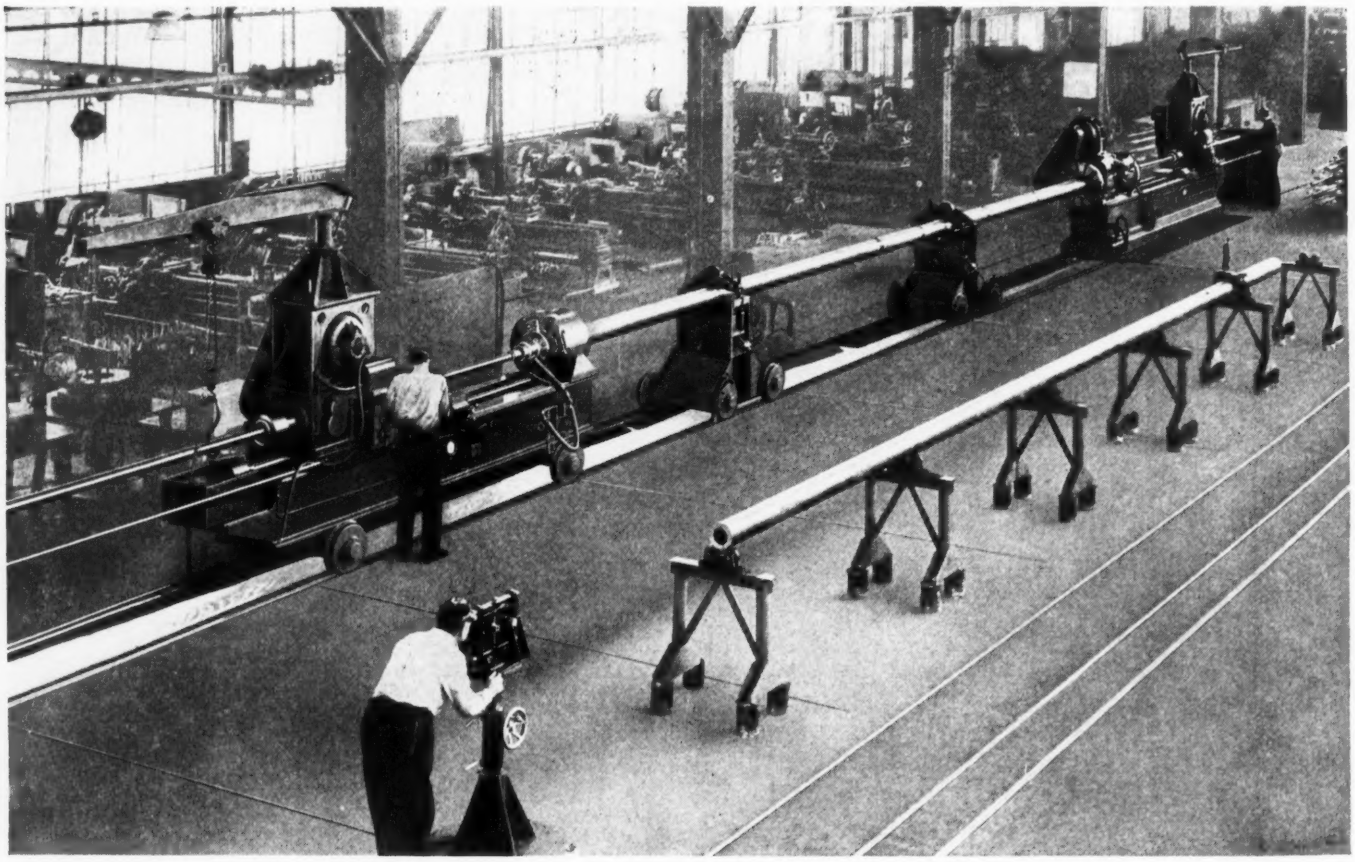


Fig. 1. Special Machine Designed for Boring Drill Collars and Grief Stems up to 80 Feet Long Simultaneously from Both Ends. In the Foreground is Seen the Method of Checking the Bore in These Parts by the Use of a Transit in Conjunction with a Target that is Moved along the Bore

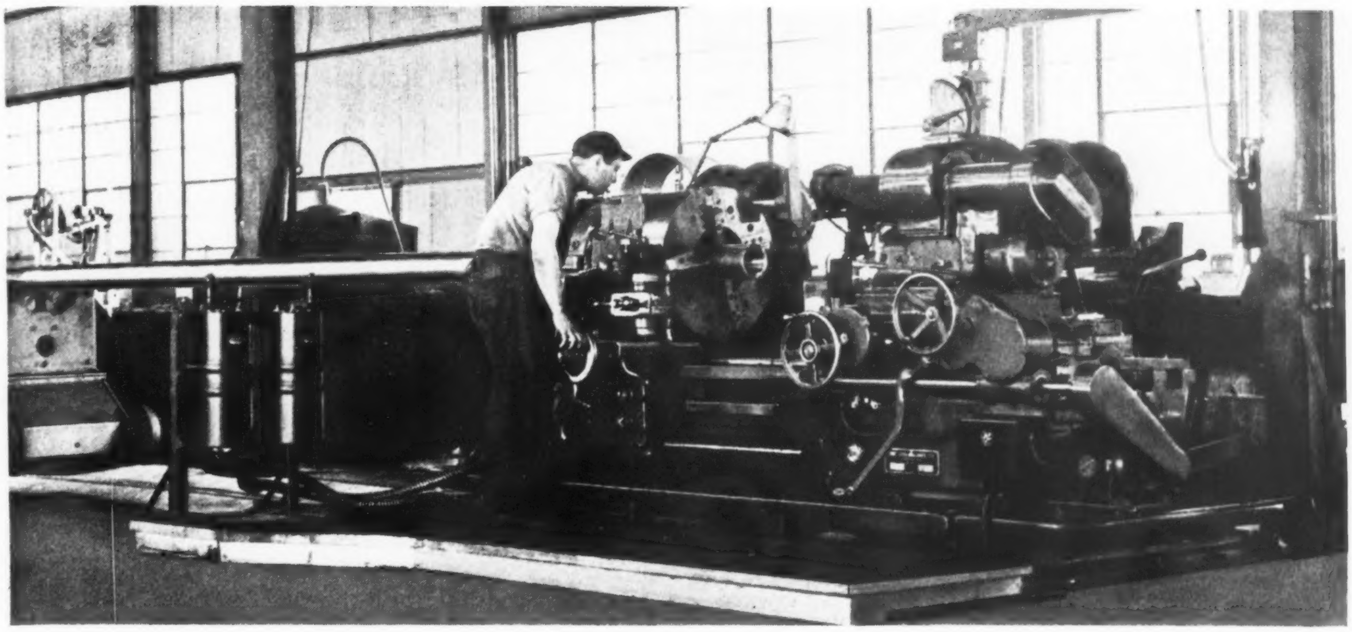


Fig. 2. Machine Employed for Milling the Tapered Thread in Both Ends of the Long Drill Collars

carriage which also has wheels that run on floor tracks. This carriage can thus be positioned the required distance from the stationary bed at the right to suit the length of the work. The bedlike carriage is also equipped for driving a boring-bar and feeding it through the work, so that long drill collars or grief stems can be bored from both ends simultaneously. The work is also supported between the chucks by steadyrests mounted on wheels that run on the floor tracks.

The drill collars and grief stems range from 4 to 10 3/4 inches in outside diameter, and are bored to diameters of from 1 1/2 to 4 inches, leaving walls of substantial thickness. They are produced from solid ingots of either S A E 3140 or 4140 steel. In the boring operation, the work is run at about 21 R.P.M. in one direction, and the boring-bar at from 25 to 100 R.P.M. in the opposite direction. Flat gun drills are used, coolant being forced in through the bored holes to the drills to wash out the chips through the boring-bars.

In boring grief stems and drill collars, the specified bore diameter must be held within 1/32 inch, and the bore must be straight the entire length of the stem within 3/16 inch in 40 feet. A single boring cut is taken from each end of the machine to attain this accuracy. At the end of the operation, a transit is employed, as seen in the foreground of Fig. 1, to check the bore accuracy by taking readings 2 feet apart for the entire length of the grief stem. These readings are taken on a target that is moved in the bore of the grief stem.

In rough-turning the drill-collar forgings prior to boring, cuts from 1/4 to 3/8 inch deep are taken with Kennametal tools at a feed of 0.022 inch per revolution and a speed of 72 R.P.M. (on 7 3/4-inch diameter forgings of S A E 3140 steel).

Threads are milled in both ends of the drill-collar bores by the Lees-Bradner machine illustrated in Fig. 2, the long drill collar being supported on a carriage that runs on floor tracks, as seen at the left, while the front end of the drill collar is held in a chuck and revolved around the rotating cutter. The threads are tapered, are usually four per inch,

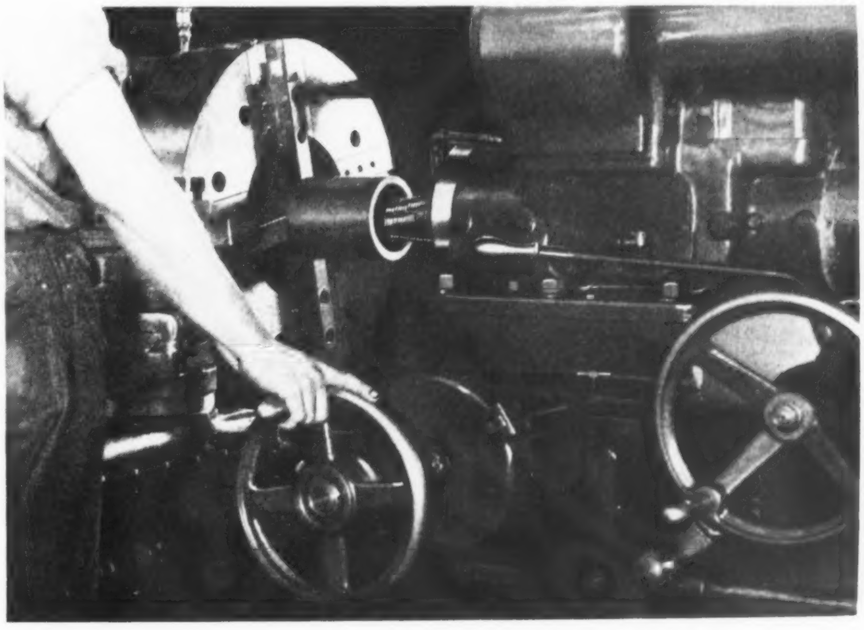


Fig. 3. Close-up View of a Thread Milling Operation in a Rotary Drill Collar, Performed by the Machine Shown in Fig. 2

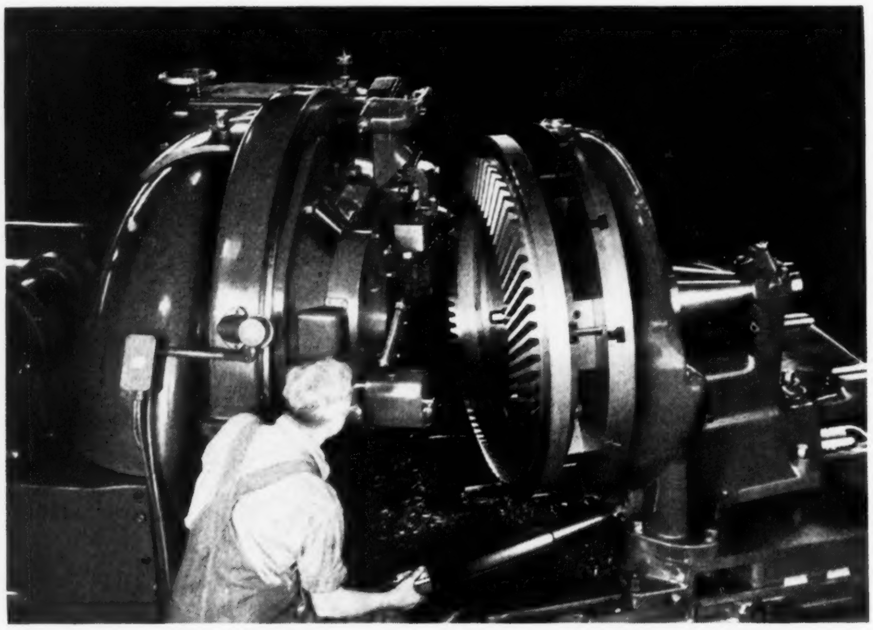


Fig. 4. Cutting the Teeth of a Spiral Bevel Gear on a Machine that is Capable of Handling Gears up to 60 Inches in Diameter

and are from 6 to 6 1/2 inches long. The taper must be true within 0.001 inch for the complete length. A close-up view of the thread milling operation is shown in Fig. 3.

When the thread has been cut, a gage is screwed into the threaded hole, after which the end of the drill collar is faced in the thread milling machine with respect to the gage in order to obtain the correct length of thread. When both ends of the drill collar have been threaded and faced, a fixture embodying a telescope is placed on one gage for taking a reading on a scale mounted on the gage at the opposite end of the drill collar for determining the alignment of the threaded ends.

Spiral bevel gears up to 60 inches in diameter and their pinions are cut on the large Gleason machine shown in Fig. 4. The pinions are mounted on the end of the work-head opposite to that on which the gears are mounted, the work-head being swiveled on its base to suit. In cutting the gears and pinions, a stocking cutter is first employed to hog out the bulk of the material, after which semi-finishing and finishing cuts are taken. The gears are not removed from the machine until they are completed, but the pinions are taken off after roughing, to facilitate machining them in quantities.

The spiral bevel gears and pinions are then tested in pairs on the machine illustrated in Fig. 6 by running them together with and without load. Loads are applied by a brake on the driven work-spindle. Before this test the gear and pinion are matched for center-to-center distance so as to obtain the desired tooth contact. Prussian blue is applied to the gear and pinion teeth in order to check the contact area on all teeth.

The teeth of the spiral bevel gears and pinions are then flame-hardened with the equipment illustrated in Figs. 5 and 8, both sides of the teeth being hardened on some gears, and one side only on other gears. A mixture of natural gas and oxygen is supplied to the two torches of this machine which, as shown in Fig. 8, are constructed with a series of swiveling arms that have small holes through which the flame jets are emitted. These swiveling arms are adjusted to conform to the contour of the gear teeth when the torches are lowered into the heating position.

The natural gas and oxygen are passed through a mixing valve on the stand seen at the rear in Fig. 5, which is equipped with Rotometers for indicating the amount of flow. Water for quenching the heated gear teeth is delivered to two long nozzles seen in back of the torches in Fig. 8, air being mixed with the water so as to obtain a fine quenching mist. The proportions of air and water can be changed to suit different types of steel, so as to avoid cracks or other defects resulting from improper hardening conditions.

The practice is to heat both

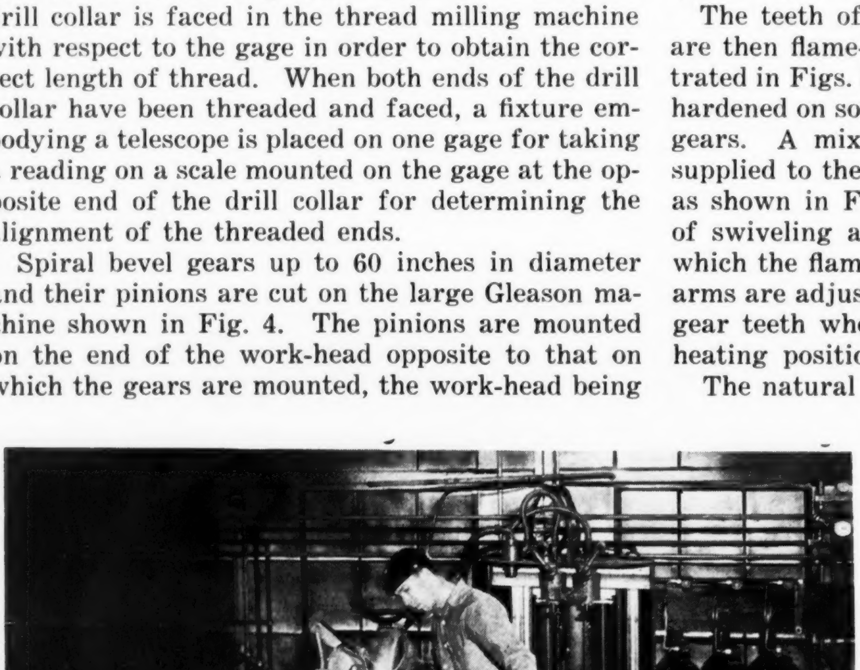


Fig. 5. The Teeth of Spiral Bevel Gears and Pinions are Flame-hardened by Torches and Quenching Nozzles, Designed as Shown in Fig. 8

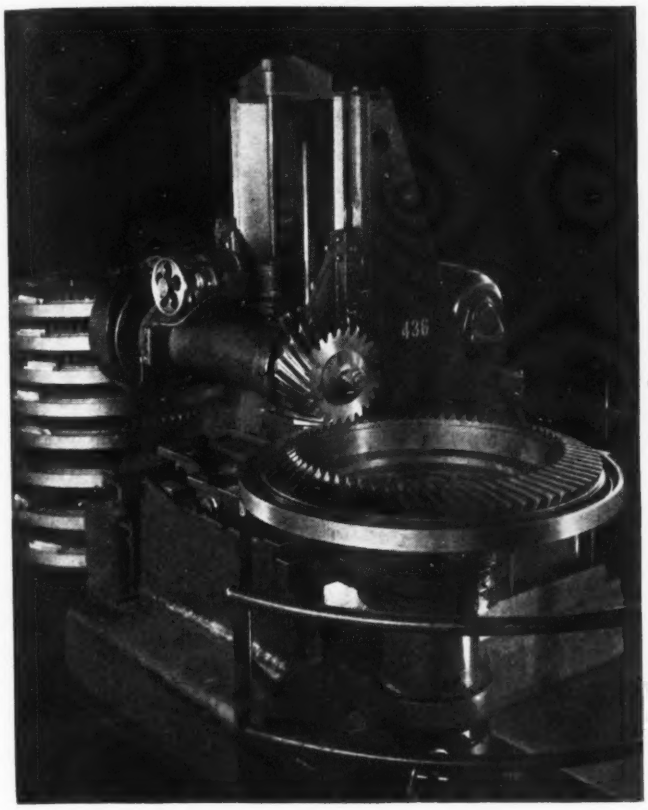


Fig. 6. Spiral Bevel Gears and Pinions are Carefully Checked for Tooth Contact before and after Flame-hardening of the Teeth

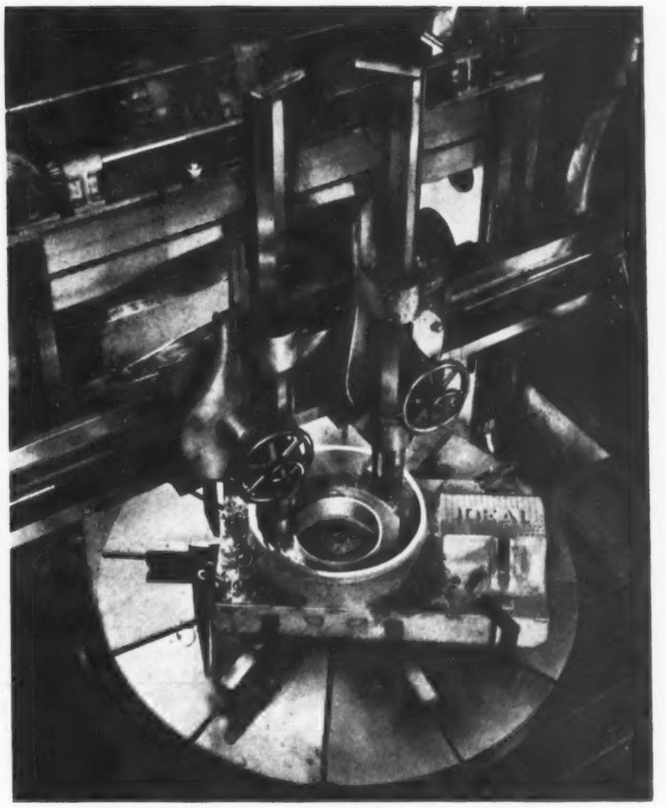


Fig. 7. Unusual Accuracy is Required in Some of the Boring Operations Performed on Large Castings for Oil-well Equipment

sides of a tooth with the torches and then advance the torches a distance of four teeth for another heating operation while the tooth previously heated is being quenched. This procedure is necessary because of the required spacing between the torches and the quenching nozzles, and hence the gear has to be rotated four times before it is completely flame-hardened. Water is circulated to the inside of the torch elements for cooling purposes.

The period of heating is controlled by an automatic device seen at the right in Fig. 8, which raises the torches out of contact from the work at the end of a predetermined heating time. This timing device is reset each time the torches are lowered on a gear tooth. The table on which the work is mounted has a universal adjustment to enable a gear to be placed in any desired position.

After all the teeth have been hardened, the gears and pinions are returned to the testing machine illustrated in Fig. 6 for a second checking of the tooth contact. In making this test, a fine lapping powder is applied to the gear teeth.

Teeth are hobbed around the rim of sprockets up to 60 inches in diameter by the machine shown in Fig. 9. The teeth are hobbed from the solid rim of the steel castings. In the illustration, teeth of about 3 1/8 inches circular pitch are being cut around a sprocket approximately 30 inches in diameter.

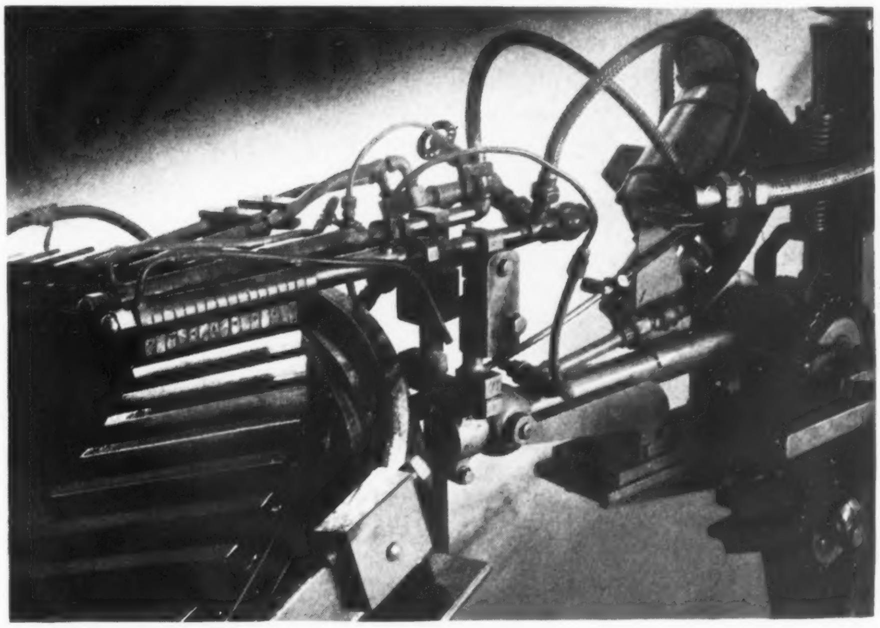


Fig. 8. Close-up View of Torches, Quenching Nozzles, and Timing Mechanism Provided on the Flame-hardening Machine Shown in Fig. 5

Fig. 9. Hobbing Teeth of 3 1/8 Inches Circular Pitch on a Cast-steel Sprocket Approximately 30 Inches in Outside Diameter

In the next installment of this article, to be published in a coming number of MACHINERY, the manufacture of tapered roller thrust bearings as used in oil-well drilling equipment will be illustrated and described, together with operations on other parts.

* * *

A typical operation on one of the larger boring mills in the shop is shown in Fig. 7. This consists of taking a variety of deep boring and turning cuts, as well as facing cuts, on the base for a rotary machine that sinks the drill into the ground in drilling oil wells. Limits as close as 0.005 inch are specified on the diameter of the thin wall section being machined in the center of the casting, as bearing races are fitted to this wall. The fit ranges up to 42 inches in diameter. The two tool rams of the machine are applied simultaneously.

Aircraft Electric Motors

Direct-current electric motors that combine lightness and compactness with high power output are now made in a range of from 1/100 to 3 H.P. by Air Associates, Inc., Bendix, N. J. These motors are built according to the U. S. Army Air Corps Specifications, and are designed especially for aircraft power needs, such as the operation of hydraulic and fuel pumps, landing-gear retracting mechanisms, tow target winches, anti-icing equipment, wing flaps, and similar uses. Magnesium-alloy castings are used for the motor frame to reduce its weight. The motors are insulated with fiber glass and special heat-resisting varnish. They are available for currents of 6, 12, and 24 volts.

Practically All Heat-treating Processes in the Rock Island Arsenal are Provided with the Latest Type of Automatic Control, No Expense having been Spared to Insure a Close Check on Heat-treating Operations. There are Approximately Fifty Micromax Potentiometer Controls, Supplied by the Leeds & Northrup Co. Armour Plate and Forging Furnaces are Equipped with a Micromax Rayotube and a Micromax Electric Proportioning Control, and there is a Large Stress Relieving Furnace in the Welding Shop which is Supplied with a Micromax Electric Proportioning Control

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Cast Iron for Planer Beds

Q. R.—Can you recommend a suitable cast iron for large planer beds? The iron should be as hard as possible and still machinable or it should be of a type that can be flame-hardened after machining. The beds will probably be cast in sections 12 feet long, and will weigh about 12,000 pounds. The sliding surfaces of the ways must give good wear.

Answered by Editor, "Nickel Cast Iron News"
International Nickel Co., Inc., New York City

The experience of several of the largest machine tool builders in the country indicates that the best type of iron for castings such as described would have a composition about as follows: Total carbon, 3 to 3.15 per cent; silicon, 1.35 to 1.60 per cent; manganese, 0.80 to 1 per cent; and nickel, 1.25 to 1.50 per cent. To obtain the best wearing properties, this iron must be poured at a minimum of 2600 degrees F. It requires special care in the foundry. The mixture should be made up with a minimum of 35 per cent of steel, in order to obtain the required amount of carbon. It is understood that the molten metal will have to be deoxidized. The hardness will be in the neighborhood of 210 to 260 Brinell.

It has been shown, both by tests and in practice, that the type of iron described flame-hardens readily. It is, however, recommended to keep the nickel content on the high side of the range given, to obtain the full benefits of flame-hardening.

Returning Machinery as Defective

L. H. F.—Can a purchaser who has made use of a purchased machine for a long period of time, rescind the purchase contract on the ground that the machinery is defective?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

Various Courts have held that a buyer who accepts machinery having a defect which is obvious upon reasonable inspection waives his right to complain of defects later. This rule of the law is applicable to purchasers who refuse to pay for machinery after they have used it for some time on the grounds that the machinery is defective.

In the case Monroe Co. v. Wood [197 S. E. 39], the question came up as to whether a purchaser could refuse payment after having used a machine for a considerable period of time, contending that it was of inferior quality. The higher Court held that the purchaser must pay the full purchase price and that he could not recover damages from the seller. Said the Court: "There was no question of patent or obvious defects . . . Day after day for five years the purchaser received, accepted, and paid for a commodity of commerce which he claims was defective. The doctrine of waiver . . . conclusively shows that his claim for damages cannot now be sustained."

* * *

Intensive Training for Drafting Work

With the increasing demands for draftsmen, the Westinghouse Electric & Mfg. Co. has found it necessary to develop a plan for intensive training. The problem has been worked out at the Sharon Works, Sharon, Pa., by having high-school students in drafting spend their time in the shop instead of in the school classrooms. Thirty-seven students who had finished at least four semesters of mechanical drawing at school were selected; in seven weeks, they completed a course normally requiring as many months. Under the plan, these boys spent the working hours at the plant learning the standard methods and practices of the Westinghouse company, under the direction of a full-time instructor. The course also included the study of manufacturing operations. Elementary physics, electricity and magnetism, and the principles of transformer operation were also part of the training program.

* * *

A Wood Preservative that Offers Protection against Termites

One of the greatest drawbacks in the use of wood as a construction material has been its susceptibility to the destructive action of termites and fungi. A number of years ago, the Dow Chemical Co., Midland, Mich., began laboratory research, accompanied by field tests, for the purpose of developing the right kind of wood preservative. As a result, it has been found that pentachlorphenol—Dowicide VII—is a most effective preservative. This product, it is claimed, offers complete protection. The wood is treated by the vacuum impregnation process.

National Machine Tool Builders' Shell Machines

A New Design of Machine for Making Shells, Developed by the National Machine Tool Builders' Association and Placed in the Hands of the War Department to be Built in Any Well Equipped Machine-Building Shop

THE machine tool industry, working through the Defense Committee of the National Machine Tool Builders' Association, some months ago designed a line of special machines for making shells. The purpose of the project, undertaken at the suggestion of Army Ordnance officers, was to put into the hands of the War Department complete and tested designs for shell machines that could be built quickly in any well equipped shop whenever the need for them arose.

By making it possible for plants not otherwise engaged in the Defense Program, such as those manufacturing printing presses and textile machinery, to build shell machines, the machine tool industry has broadened the source of supply, and at the same time, freed itself to a great extent to concentrate on the production of equipment for aircraft engines, tanks, guns, and other items that require precision machine tools. Though shell manufacture is important, it is not a precision job in the usual sense of the word. The closest limit on a shell is 0.005 inch, and most limits are even wider.

With the Defense Program shifting into high gear, this line of shell machines is now in production. The design comprises a complete line of machines for turning, boring, and facing medium-caliber shells. The machines are of two sizes—one for the 3-inch group of shells (shown in Fig. 3), and the other for the 6-inch group (shown in Fig. 1). In each group, there is a basic machine that is standard for all the operations in that group. Each unit is then equipped with the slides, tailstock, tooling equipment, and motor drive required for a certain operation. The machines are capable of all operations except cross-drilling, notching, and such operations as nosing-in, squeezing the band into the band seat, and welding the base end-plate. The engineering work was done under the direct supervision of Myron S. Curtis, consulting engineer in machine design.

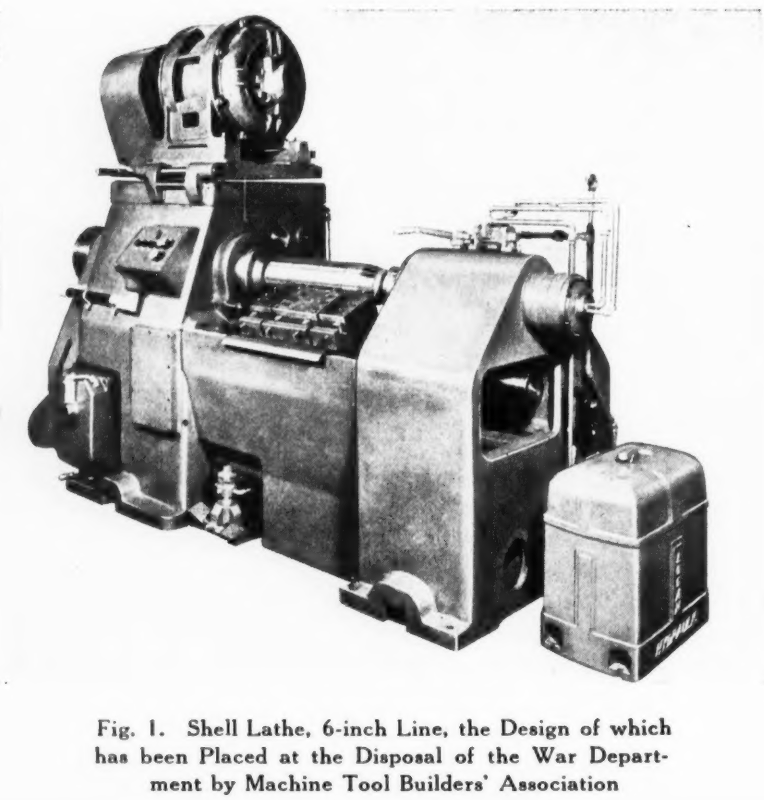


Fig. 1. Shell Lathe, 6-inch Line, the Design of which has been Placed at the Disposal of the War Department by Machine Tool Builders' Association

There are three outstanding features of the new machines: (1) They are of simple construction, so that they can be built quickly in substantial quantities; (2) they are inexpensive and can produce shells economically; and (3) they are automatic, so that they can be handled by unskilled operators.

To make the building of the machines as simple as possible, the design completely eliminates all large planing and boring operations, and all machining operations on the main casting, except for the drilling of a few small holes. This is accomplished by supporting the carriage for the turning tools, as well as the swinging arms for facing operations, entirely on longitudinal bars instead of on planed way surfaces. Moreover, these bars (of which there are three), together with the spindle, tailstock sleeve, and all shafts, are carried by bushings that are cast in place in the main base of the machine.

The casting in place of bushings is accomplished by the use of a pouring fixture (Fig. 2) for locating and sup-

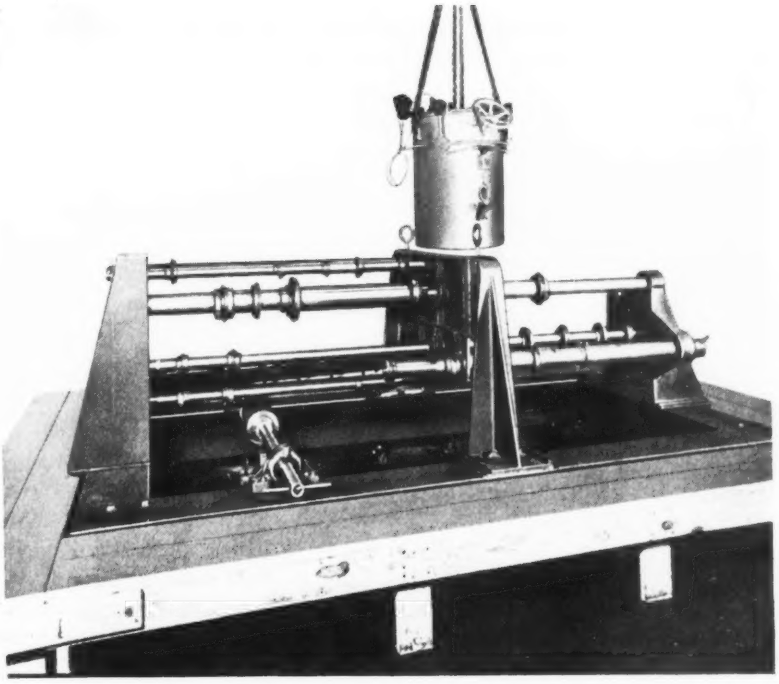


Fig. 2. Pouring Fixture for the Casting in Place of the Locating and Supporting Bushings in the Bed

arm and the bar for supporting and oscillating the turning carriage.

A constant-speed motor is belted to the feed-box for rapid traverse of the tool carriage. Certain of the tool-blocks are slideable in the tool carriage. These are controlled by a stationary cam bar. The spindle and all the shafts run in plain bearings. There is a ball thrust bearing on the spindle, as well as on the feed-drum shaft. These bearings are bronze, with a lining of babbitt metal about 0.030 inch thick.

The machine has a live tailstock center which is moved longitudinally by hydraulic pressure. The valve for controlling this hydraulic movement is operated by the binder lever; thus only one movement of the lever is required to move the center into position and clamp it. Likewise, the reverse movement of this lever unclamps the tailstock and withdraws it from the work.

There are two principal methods of holding the shell: (1) Gripping it on the inside of the open end by means of an expanding arbor, while using the tailstock center for supporting the base end of the shell; and (2) gripping it on the outside diameter by means of a collet chuck. In either case, the shell-holding mechanism is hydraulically actuated, and control is by means of foot-levers, leaving the operator's hands free. One central hydraulic system, with accumulator and tank, can serve a complete line of the machines, avoiding the greater expense of a self-contained hydraulic system for each machine.

porting the bushings on pilot bars, and the use of a low melting point lock-in metal. The base of the machine has pouring holes cast in it, and, in some cases, two bushings are poured through the same hole. The recommended pouring metal is a lead-tin, high-bismuth alloy which expands slightly upon cooling.

In addition to the bushings supporting all shafts, the seat upon which the cover plate rests is also made of this alloy. The metal is poured in a trough on the top of the headstock of the machine and allowed to find its own level. The cover plate, which also serves as a support for the motor, is then fastened to the base casting upon this seat. All doors and plates are attached to the rough base casting by cap-screws. Doors and plates are equipped with Neoprene gaskets to insure oil-tight joints, as the door seats are not machined. The machines are all single-speed units, except in cases where two-speed motors are used. The motors vary from 10 to 60 H.P., depending upon the operation to be performed.

The main drive of the machine is from the motor, mounted on top of the headstock, through V-belts to a drive shaft, and then through a jack-shaft to the spindle. The drive to the feed mechanism is through a chain and sprockets to a set of pick-off gears, and then through a shaft to a feed worm and gear. This gear drives a drum cam that reciprocates a sliding bar on which is located the turning carriage, as well as the face cams for operating the facing

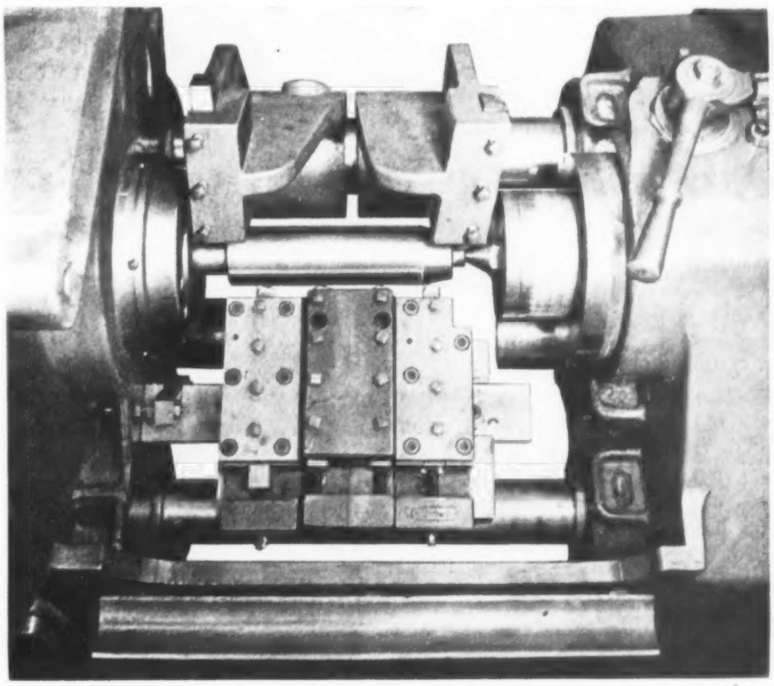


Fig. 3. The 3-inch Size of Shell-turning Machine Tooled up for Rough-turning and Facing the Ends of 75-millimeter Shells Simultaneously

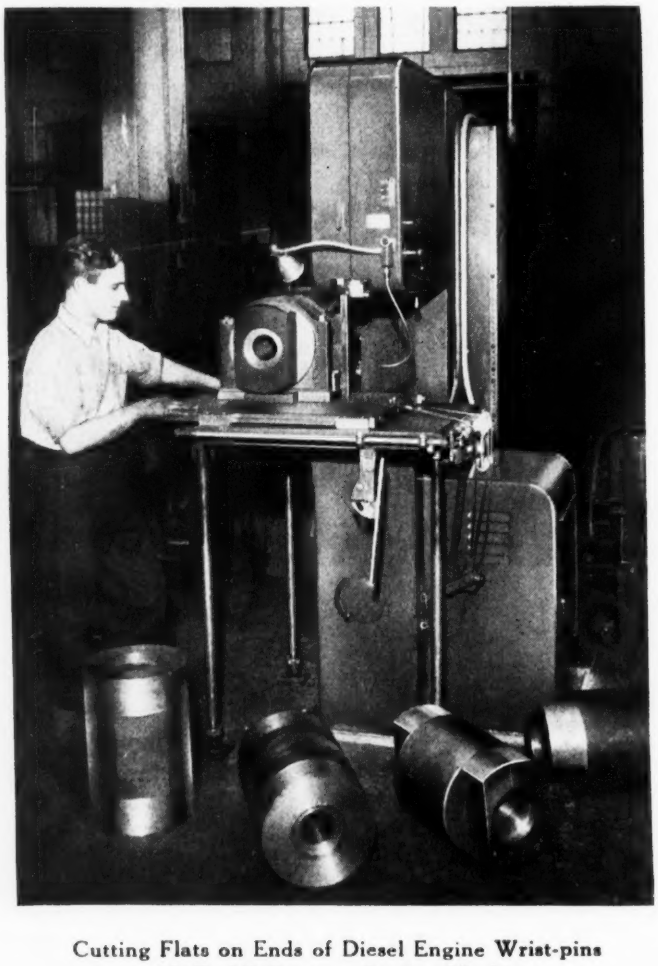
Lubrication of the machine is by gravity from a trough cast in the top of the base, oil-pipes leading from the trough to the various bearing surfaces. The oil settles in a sump in the base of the headstock, from which it is pumped by a separate motor-driven unit through a strainer and pressure valve back to the oil trough. The pressure switch consists of an electrical unit, so connected with the control system that none of the operating motors, with the exception of the lubricating pump motor, can be started or operated unless there is sufficient pressure on the lubricating system.

It is intended that coolant be supplied to a line of machines by gravity from a central tank, the coolant from the machines being pumped back to the tank from a collecting sump. The central system serves two purposes—it reduces costs, and it keeps the coolant at a lower temperature.

Saving Time and Material by Contour Sawing

THE possibilities of contour sawing as a means for saving time and material deserve special consideration at this time, when it is so important that maximum production be obtained from all types of machine tools. Releasing other machines or equipment from work that can be handled more efficiently by contour sawing is an important function of a contour sawing machine. This point is demonstrated by the rather unusual sawing operations here illustrated.

The wrist-pins for Diesel engines on which the sawing operations are performed weigh 350 pounds each, are 12 inches in diameter and 16 inches long, and are made of carbon steel. The operations consist of taking four end cuts, each 4 inches deep, and four side cuts, each 2 1/2 inches deep. This work, as formerly done by milling, required eight hours' time. As shown, the end cuts are now accomplished by contour sawing, twenty-four minutes being required for each end cut and eighteen minutes for each side cut, or a total of two hours forty-eight minutes. This work is being done at the plant of the Northberg Mfg. Co., Milwaukee, Wis., on a DoAll machine made by Continental Machines, Inc., 1312 S. Washington Ave., Minneapolis, Minn. The concern states that the milling machine previously used for this job is now producing twice as much work of another kind, when considered in terms of profits.



Cutting Flats on Ends of Diesel Engine Wrist-pins with DoAll Contour Sawing Machine

The ingenious shop-made feed arrangement operated in connection with the regular power feed is of particular interest. This feed consists of a special table with roller bearings protected by felt wipers, the roller bearings having hardened steel strips on which the work-holding fixture can be positively located for all sawing positions. No layouts are necessary. The saw used is 1 inch wide, has six-pitch raker style teeth, and is operated at 150 feet per minute. About 50 pounds of metal is saved per wrist-pin by this sawing operation.

* * *

Device for Measuring the Resistance of Surface Finishes to Rubbing Abrasion

A testing device known as an "Abraser" has been developed by the Taber Instrument Co., North Tonawanda, N. Y., for determining the resistance of surface finishes to rubbing abrasion. The device will test not only painted, lacquered, electroplated, and plastic surfaces, but also textile fabrics, ranging from sheer fabrics to upholstery. It consists of a motor-driven turntable, on which the specimen is mounted, and two abrading wheels that alternately rub back and forth, and at the same time criss-cross. These wheels are made in five types from special grades of fine abrasive grain, each type to suit the kind of surface being tested. A load adjustment is provided for varying the pressure of the wheels against the specimen to suit the type of material being tested.

Finishing Shells by Centerless Grinding

A New Method for Finishing Shell Bodies and Armor Piercing Cores

By L. E. MEHLHOPE
Cincinnati Grinders Incorporated
Cincinnati, Ohio

WITHIN the last three or four years several hundred centerless grinders have been sent to Europe to be used on shell work. Thus considerable experience has been obtained in applying these machines on this class of work. An outline of the methods used is recorded here for the benefit of manufacturers who may wish to employ the same methods in this country.

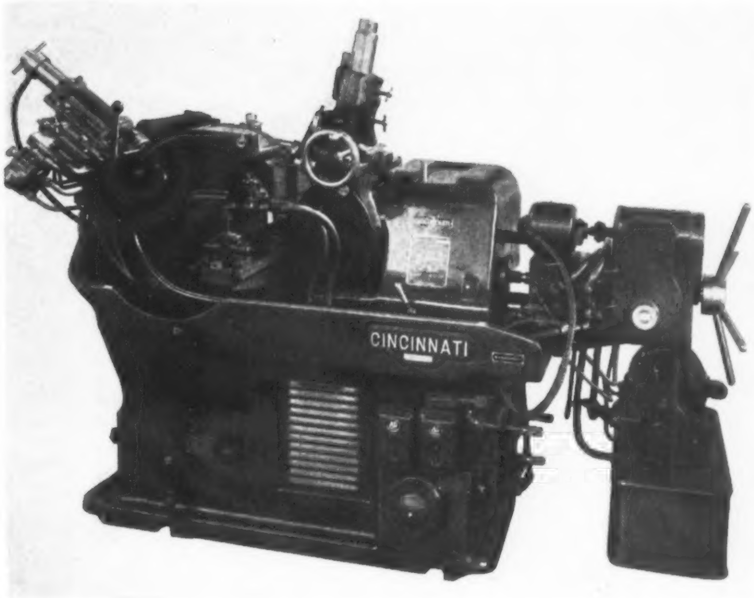


Fig. 1. Centerless Grinder Equipped with Servo Hydraulic "In Feed" Attachment and a Magazine from which the Shells are Pushed or Fed Automatically into the Wheel Throat

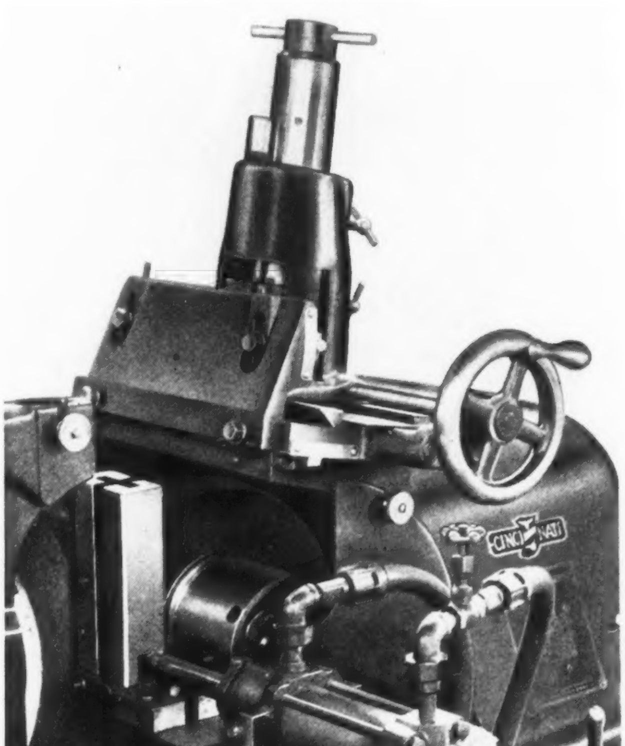


Fig. 2. Close-up View of Vertical Magazine and Special Work-loading Pusher

One of the advantages of the centerless grinding principle as applied to shell grinding is that it tends to produce the largest possible true cylinder from the rough stock, regardless of its condition of roundness. Also, as the work is located from the outside diameter, less stock need be allowed for finishing. Since sizing of the work is accomplished across the diameter, it is possible to finish the shells accurately within close limits.

The two well-known methods of centerless grinding, "through feed" and "in feed," have been applied to finishing operations on shells. "Through feed" is applied to work that has a single diameter. The grinding and regulating wheels remain a fixed distance apart, and the work is passed between them. No adjustment of the wheels toward each other is made, except to compensate for wheel wear. Each piece of work is passed through the wheel throat one or more times, depending on the amount of stock to be removed and the finish desired. The maximum diameter of a multi-diameter part can be ground by this method if the maximum diameter extends the major portion of the shell and the center of gravity is within this area.

With the "through feed" method, idle machine time is practically eliminated, since one piece of work falls immediately behind the preceding one. Frequently hoppers are used to feed the work to the machine, either to enable one man to tend two machines or because it is impractical to load by hand and maintain the machine pace.

The "in feed" method can be used for finishing

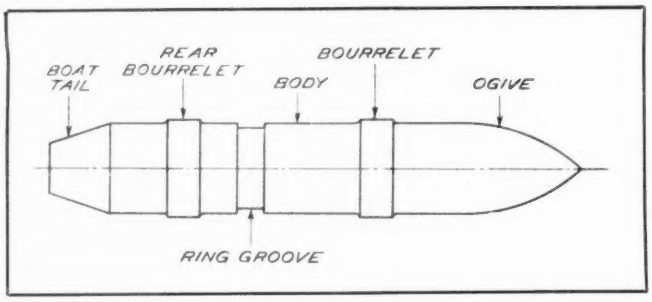


Fig. 3. Diagram of Typical Shell, with Terms Used to Designate Various Surfaces

several diameters of a multi-diameter part. It can also be used for finishing work that has an irregular profile, such as a shell ogive (see Fig. 3) and for spherical and tapered surfaces.

Standard profile truing attachments are available for shaping the grinding and regulating wheels to suit the work. The support blade must also be shaped. With the "in feed" method, some time is consumed in loading the work piece, advancing the regulating wheel, grinding, and ejecting the work. However, the position of the operator in front of the machine reduces these movements to a minimum in time and effort. For some classes of work, hoppers and automatic "in feed" attachments can be used to advantage. In some cases, magazine devices can be employed to speed up a loading operation or to prevent an odd-shaped piece from being incorrectly placed between the wheels.

One factor in applying centerless grinding should be thoroughly understood, namely, the maintenance of concentricity. Since the work is located and supported from the outside diameter, the stock is removed from the periphery in a manner similar to the unwinding of a spiral spring. As the stock removal per revolution of the work is very small, the finish-ground surface will be practically concentric with the same surface in its rough state. In many cases, however, it is impractical to control the concentricity of the ground diameter with respect to some other inside or outside diameter. This is of material importance in some operations, but in most shell grinding operations, the eccentricity allowed is large enough to make consideration of this factor unnecessary.

In general, the concentricity of the outside diameter of a part will be changed but little by the centerless grinding operation. Three sizes of centerless grinding machines that can be used for shell finishing work are regularly manufactured by Cincinnati Grinders Incorporated. The first of these is the No. 2 centerless grinder, shown in Fig. 1, which is driven by a 15-H.P. motor. The maximum size grinding wheel used on this machine is 20 inches in diameter by 8 inches wide. It can be used for work up to 3 1/2 inches in diameter.

The next larger machine—No. 3—uses up to a 30-H.P. motor. The maximum size wheel employed is 24 inches in diameter and has a 10-inch face. For some light operations, a wheel having a face width of 15 inches has been supplied for this machine. It has a capacity for work up to 6 inches in diameter.

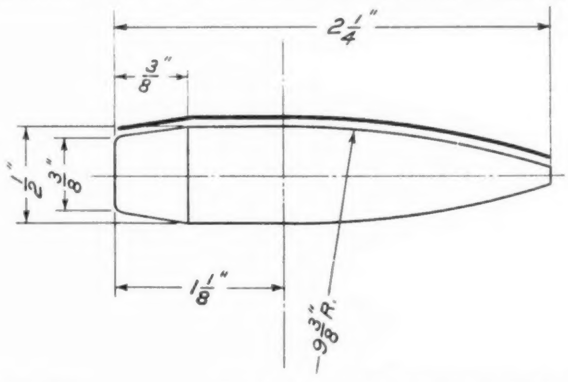
The third machine—No. 4—has practically the same capacity as the No. 3, except that it will take work up to 9 inches in diameter. The bed of this machine is inclined slightly to assist in the rotation of heavy work.

Since many steel mills can supply centerless-ground bars, most shell manufacturers are unlikely to install their own bar grinding equipment. Bars from 1/8 inch to 4 inches in diameter and up to 18 feet in length, however, can be ground efficiently on centerless machines.

Finishing 0.30- and 0.50-Caliber Armor-Piercing Cores

Armor-piercing cores, similar to the 0.50-caliber core shown in Fig. 4, can be finished on the centerless grinder in either of two ways. The whole profile can be finished by the "in feed" method or the straight outside diameter only can be finished by the "through feed" method at a very rapid production rate. With the latter method, the cores are finished to size on the screw machine, except for a grinding stock allowance on the outside diameter. After heat-treatment, they can be given one pass through the No. 2 centerless grinder to bring them to an accurate size on the outside diameter only.

It is necessary that the cores pass through the wheel throat with the nose of one against the base of the next in order to prevent piling of one on the other. With the high rate of production obtainable, it is desirable to use the hopper that is now available for feeding the work to the machine.



Operation	Surfaces ground are indicated by a heavy black line
Stock removed	0.004 to 0.006 inch
Finish	Good commercial
Number of cuts	1
Limits actually obtained	± 0.0004 inch
Production	15 pieces per minute, or 750 shells per 50-minute hour

Note: When limits of less than 0.0005 inch are specified, or where a greater amount of stock must be removed, so that two cuts are required at the same production rate per cut, the net production would be approximately 375 shells per hour.

Fig. 4. Data on Finishing 0.50-caliber Armor-piercing Core on Centerless Grinder by "In Feed" Method

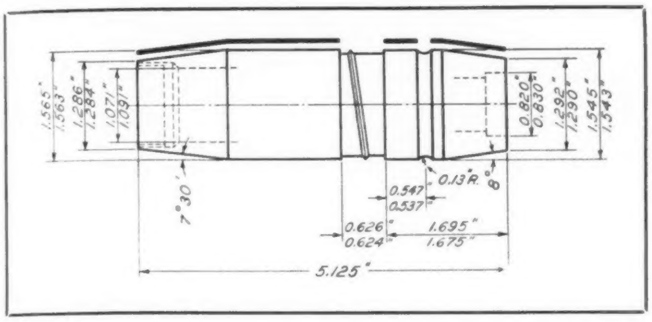


Fig. 5. Dimensions of 40-millimeter Shell Finished by Centerless Grinding the Profile

The data on finishing the outside of the cylinder portion only of 0.30- and 0.50-caliber armor-piercing shells by the "through feed" method is as follows: Stock removed, 0.003 to 0.004 inch; finish, good commercial; number of passes, one; limits on diameter, ± 0.00025 inch. The production of either caliber core by this method is 100 per minute or 5000 per hour. Concentricity of the ground diameter with the turned diameter is determined by the previous operation, and is not changed by centerless grinding.

This method uses the centerless grinder to the best advantage as a rapid sizing unit. The set-up, except for the hopper, which was developed especially for this work, is all standard equipment.

The whole profile of cores of this kind can be ground if necessary, but the productive rate will be much reduced, as indicated by the data given in Fig. 4. The method that must be used in this case is described in connection with the finishing of 20-millimeter shells, and therefore will not be covered here. The following data, however, applies to a typical "in feed" operation as performed on 30- and 50-caliber shells: Amount of stock removed, 0.004 to 0.006 inch; limits of accuracy, ± 0.0004 inch; production of 0.30-caliber shells, 18 per minute, and of 0.50-caliber shells, 15 per minute.

Operations on 20- and 25-Millimeter Aircraft Shells

Many No. 2 centerless grinders have been used in profile-grinding 20- and 25-millimeter aircraft shells of the type shown in Fig. 6. The whole outside diameter is finished, except for the rotating band groove and the crimping groove. The first operation in producing these shells is to centerless-grind the bar stock to a size approximately 0.010 inch larger than the bourrelet diameter. The shells are then form-turned from bar stock, bored, and threaded.

Next they are profile-ground on the No. 2 centerless grinder equipped, as shown in Fig. 1, with a special automatic Servo hydraulic "in feed" attachment and a magazine from which the shells are pushed automatically into the wheel throat. The "in feed" attachment has a total stroke of 7/8 inch.

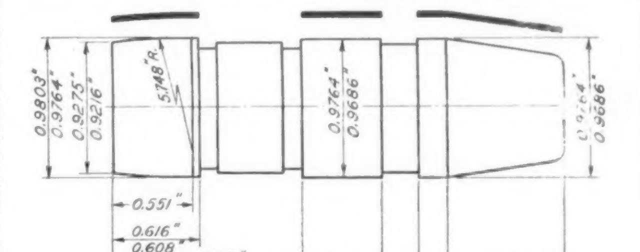
After the shell is finished, the regulating wheel slide is retracted to permit the shell to roll out between the wheel and the blade. Next, the regulating wheel slide advances about 3/4 inch, and dwells while the hydraulic pusher strips the shell from the magazine and carries it to the wheel throat. The regulating wheel slide then advances for the grinding operation. A close-up view of the magazine and hydraulic pusher is shown in Fig. 2.

One company grinds the 25-millimeter shells after the rotating band has been squeezed into place. In this case, it is necessary to make the length tolerances closer, in order to prevent the grinding wheel selected for steel from contacting the copper and thus becoming loaded with this metal. Of course, such a condition would require excessive wheel truing. The data on finishing 20-millimeter shells in this manner is as follows: Stock removal, 0.016 to 0.018 inch; number of cuts, 2; limits, 0.001 inch; production, 8 shells per minute. The data in Fig. 6 shows only one cut. The manufacturer for whom this equipment was made accepted the resultant finish as highly satisfactory.

Probably this method was worked out to compensate for the shortage of skilled mechanics. The loading of the magazines of two of these centerless grinding machines can be done by a girl. One American manufacturer of these shells devised a simple hand "in feed" set-up requiring only special cams and blade.

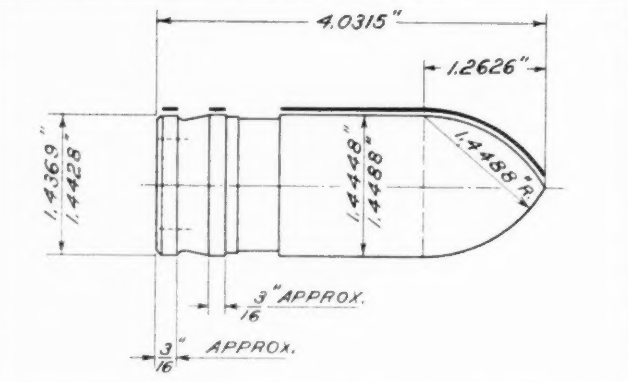
With hand-operated machines, the operator takes advantage of non-uniformity in stock, and thus obtains an increase in production. The following data applies when the hand-operated set-up is employed: Stock removed, 0.010 to 0.012 inch; number of cuts, one; production on 20-millimeter shells, 416 per hour.

So far as centerless grinding is concerned, there are two types of 37-millimeter shells. One has the ogive formed all the way out to the pointed nose, as shown in Fig. 7. The other has the ogive cut short and threaded to receive a fuse cap or base,



Operation	Surfaces ground are indicated by a heavy black line
Stock removed	0.012 to 0.015 inch
Finish	Commercial
Number of cuts	1
Limits actually obtained	± 0.0005 inch
Production	8 pieces per minute per cut, or 400 pieces per 50-minute hour

Fig. 6. View of 25-millimeter Shell and Centerless Grinding Production Data



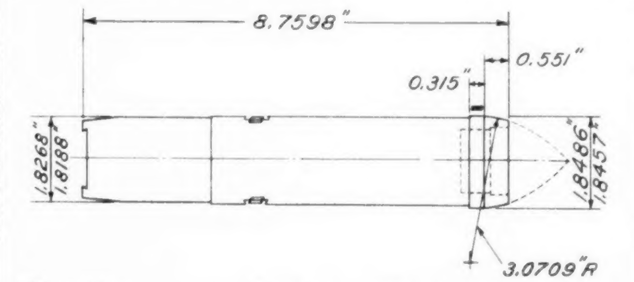
Operation..........Surfaces ground are indicated by a heavy black line
Stock removed......................0.012 to 0.015 inch (0.30 to 0.37 mm.)
Finish.............................Good commercial
Number of cuts....................................2
Limits actually obtained.................± 0.0005 inch
Production............4 cuts per minute, or 100 shells per 50-minute hour

Fig. 7. Production Data on Finishing 37-millimeter Shells by "In Feed" Centerless Grinding Method

as shown in Fig. 5. This is actually a 40-millimeter shell, but is ground by methods that are identical with those employed for the 37-millimeter shell.

The 40-millimeter shell, as shown in Fig. 5, is profile-ground from end to end by form-truing the grinding and regulating wheel and by forming the blade. The equipment is standard, except for the profile cams and blade. Since this shell is covered from end to end by the wheels, it is rather difficult to load into the machine. A loose fitting mandrel inserted in the hole, however, enables the operator to handle it easily. An extra wide retraction of the regulating wheel slide is desirable. For this shell, 0.010 to 0.012 inch of stock is removed in one cut, and a good commercial finish is obtained. The production is 200 pieces per hour, with the concentricity accuracy approximately equal to that obtained in previous operations.

The 37-millimeter shell, shown in Fig. 7, is finish-ground with formed wheels, the grinding wheel covering the nose of the shell. This shell presents another type of loading problem, which is solved by the "clip and finger" method illustrated in Fig. 8. A set of fingers is carried on a hinged bracket, which is indexed between two positions. In one position, the work is held with its axis vertical, away from the wheels, where the loading can be easily



Operation...........Surface ground is indicated by a heavy black line
Stock removed......................0.010 to 0.012 inch (0.25 to 0.30 mm.)
Finish.................................Commercial
Number of cuts.......................................1
Limits actually obtained.................± 0.001 inch
Production........130 per 52-minute hour (estimated)

Fig. 9. Data on Finishing the Bourrelet of 47-millimeter Shell

accomplished. In the other position, the work rests on the blade and regulating wheel, and the fingers are inactive. With this method, production is as indicated in Fig. 7.

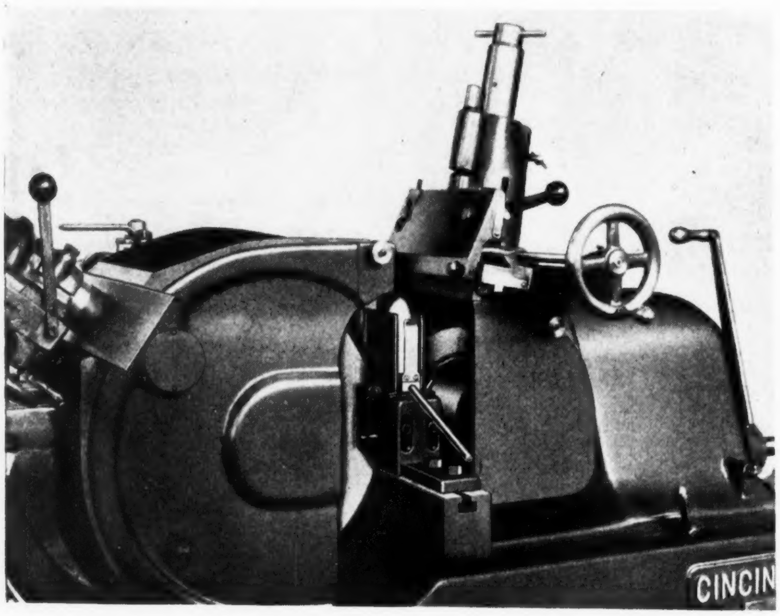
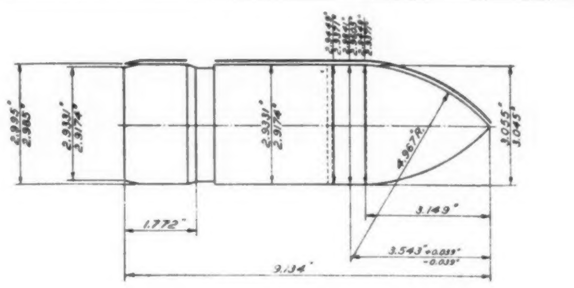


Fig. 8. Close-up View of "Clip and Finger" Device which Permits Shell to be Easily Loaded in Vertical Position and Indexed into Horizontal Grinding Position

Finishing the Bourrelet and Ogive on 47-Millimeter Shells

The 47-millimeter shell, shown in Fig. 9, is ground on the bourrelet only. In some instances (not shown), the ogive is also ground. The ogive in this case consists of a soft steel cap fitted over and projecting beyond the regular ogive. When this is the condition, a "sandwich" wheel with a soft section for grinding the hard bourrelet and a hard section for grinding the soft ogive should be used.

The work is supported on the rollers of the "in feed" work-rest on a straight body diameter as near the back end as possible. The end stop is adjustable. The shell should be accurately turned, as any out-of-roundness or large variation of size on the body portion supported by the rollers will affect the grinding results. When shells having the soft



Operation..........Surfaces ground are indicated by a heavy black line
Stock removed (on diameter).......0.020 to 0.025 inch (0.50 to 0.64 mm.)
Finish..............................Good commercial
Number of cuts.....................................2
Limits actually obtained................± 0.0005 inch
Production....2 pieces per minute per cut, or 50 pieces per 50-minute hour

Fig. 10. One of Various Types of 75-millimeter Shells Finished on Exterior Surfaces by Centerless Grinding

ogive are ground, the amount of stock removed from the ogive and the hard bourrelet should be as nearly the same as possible; if this is not practicable, two cuts should be taken to overcome unequal wheel wear. Loading and handling of these shells are accomplished by hand. This work is normally done on a No. 2 centerless grinder.

Methods of Handling Two Types of 75-Millimeter Shells

There are two types of shells to be considered in finishing the 75-millimeter class, although there are three major forms; high-explosive, shrapnel, and gas shells. Some of these shells are smooth and short, while others are much longer, with the body portion slightly smaller than the bourrelet, with rear bourrelet and boat-tail. One of these shells is formed all the way to the point, as shown in Fig. 10. This shell is ground over the complete profile on a No. 3 centerless grinder equipped with wheels 10 inches wide and with the necessary profile truing attachments and formed blade.

As the weight of the shell—about 10 pounds—would make it difficult to handle by the "clip and finger" method, rails are employed to support the work. These rails extend to the front of the machine. The shell is placed on them and pushed into the wheel throat by a special pusher provided with a bayonet lock for fastening it in the grinding position. The pusher then acts as an end-stop to locate

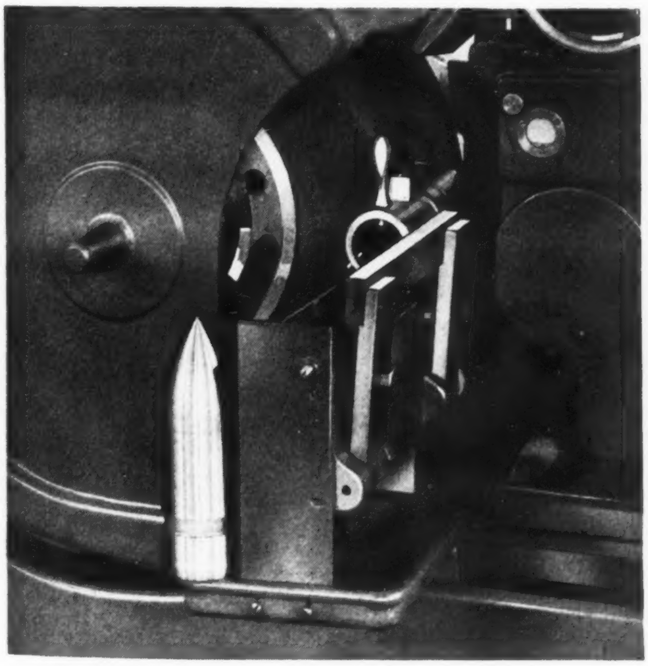
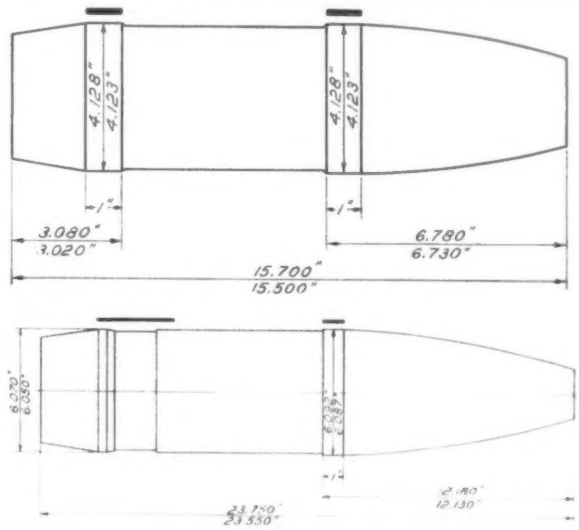


Fig. 11. Centerless Grinder Equipped with Rails on which Shell is Pushed into Wheel Throat by Device with Bayonet Lock for Holding Work in Grinding Position



Operation....Grind front and rear bourrelet diameters, as indicated by heavy black lines
Stock removed on 105-mm. shells....0.008 to 0.012 inch
Stock removed on 155-mm. shells....0.012 to 0.015 inch
Finish .... Commercial
Number of cuts.. 1
Limits actually obtained................± 0.0025 inch
Straight and Round, 0.001 inch
Production on 105-mm. shells....90 per 50-minute hour per cut
Production on 155-mm. shells....60 per 50-minute hour per cut

Fig. 12. Data on Finishing Front and Rear Bourrelets of 105- and 155-millimeter Shells

the work in the proper relation to the wheel form. A standard hand "in feed" cycle is used to grind the shell. Two cuts are required, one for roughing and one for finishing.

The 105- and 155-millimeter shells shown in Fig. 12 have two bourrelets, but some of the shells of these sizes have only one. Better finishes and tolerances for size, taper, and roundness are obtained in finishing the bourrelets of these shells on the centerless grinder if two diameters, spaced as shown, are ground on each cylinder, even if the rear one is not required for proper functioning of the shell. When the total wheel contact is only about

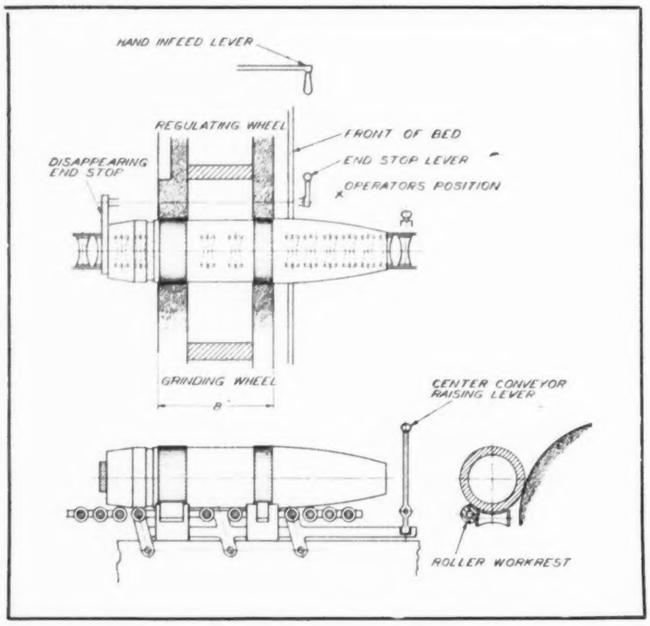


Fig. 13. Loading and Work Supporting Unit Used for Heavy Shells Such as Shown in Fig. 12

3 inches, and the over-all spread of the wheels is not over 8 inches, the No. 2 centerless grinder can be employed. For shells requiring a spread greater than 8 inches, the No. 3 centerless grinder should be used.

Automotive practice has been followed in the work-rest or fixture design. This unit, shown in Fig. 13, contains the support blade for the work and the regulating wheel. In addition, there is an elevating section of the fixture, hand-operated and carrying closely spaced rollers, as shown in the lower view. This section, when operated, raises the work above the support blade and wheels, so that it can be rolled into and out of the machine.

The machine can be placed directly across a conveyor line of this type, in which case the shells can be loaded, ground, and ejected at the back end on another conveyor. If desired, however, the work can be ejected at the operator's side. The principal advantages of this fixture are reduced labor and handling time.

Methods of Handling 60- and 81-Millimeter Trench Mortar Shells

The 60- and 81-millimeter trench mortar shells are somewhat similar to the 105-millimeter shells, except that a small percentage of the total length of the shell is finished to the full diameter. This makes it necessary to use a special type of locating device for holding the work between the wheels. The work fixture, shown in Fig. 14, consists of a hinged cradle in which the work is placed. It is arranged so that the center in the small end of the shell engages a dead center in the fixture. The cradle is lowered to the grinding position, the work being supported on the center and on the work-support blade under the large diameter. The regulating wheel is set with a reverse angle, so that it tends to force the work back on the locating center. The operation consists of grinding the bourrelet, 0.008 to 0.012 inch being removed in the case of the 81-millimeter shell, and 0.012 to 0.015 inch in the case of the 60-millimeter shell. A commercial finish is obtained in one cut, the work being held to size within 0.001 inch. The production rate on both the 81- and 60-millimeter shells is 120 per hour.

* * *

A Case where Rubber Wears Better than Steel

According to information made available by the B. F. Goodrich Co., Akron, Ohio, a large western company that operates a stamp mill handling quartz always considered manganese steel plates, 1 inch thick, as the only material that would resist the bullet-like impacts of the highly silicified quartz thrown against it in the stamp mill. As an experiment, the mining company replaced the steel plates with Armorite rubber lining, 3/4 inch thick. The results were quite surprising.

After more than 3000 tons of quartz had been crushed, the rubber lining showed practically no wear, while a similar tonnage would wear down manganese linings to from one-third to one-half of their original thickness. It is also stated by the mining company that Armorite, in addition to costing less than manganese steel, can be installed in a shorter time and, therefore, reduces the period that the mill has to be shut down. Furthermore, the rubber sheets are safer to handle than the heavy manganese plates.

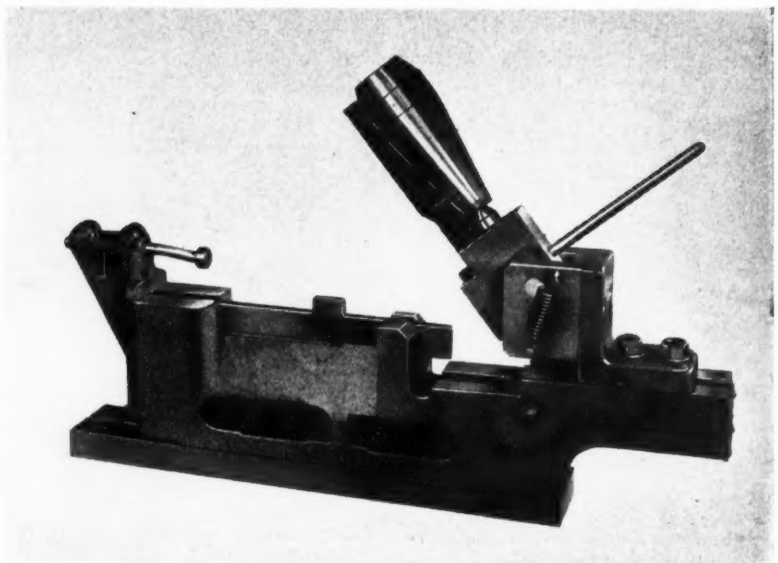


Fig. 14. Hinged Cradle Type Fixture for Lowering 60- or 81-millimeter Trench Mortar Shells to the Grinding Position

Continuous Corrugating Press

By JOSEPH WAITKUS

THERE are two generally accepted methods for corrugating sheet materials, each of which has a particular application. The first consists of forming the material between two corrugated rolls. This method is very rapid, but is only suitable for shallow corrugations. The second method is to press the corrugations into the material in a press brake. The latter procedure is much slower, but is better adapted for making deep corrugations.

In order to speed up production, several corrugations can be made at each stroke of the press. However, the possibility of stepping up production in this manner depends on whether or not the material can be drawn. When several corrugations are produced, the material is stretched to fill the depression in the die, and is therefore heavily stressed. This may lead to difficulties in certain applications of the corrugated material, and is avoided by making each depression separately. The material is then free to be pushed into the die depression with as little stressing as possible. It was to meet the latter condition that the equipment shown in the accompanying illustration was developed.

The thin material handled with this equipment is obtained in roll form, and the corrugating operation is continuous. The corrugations are deep, and it is desirable to avoid stresses as much as possible, making it necessary to press or form each corrugation in a separate operation.

The equipment consists of three distinct parts, a feeding and brake mechanism; the press; and a spacing mechanism. The feeding and brake mechanism includes a feeding roller *A*, Fig. 1, supported in two bearings in the side plates *B* fastened to the table *C*. Both ends of roller *A* extend through the side plates. The driving arrangement is located at one end of the roller, and a braking device is fastened to the other end.

Design of Stock-Feeding Mechanism

The driving mechanism consists of a ratchet *D*, fastened to the shaft extension of roller *A*, and a pawl *E*, fitted into a cylinder which is part of the floating plate *F*. The pawl is forced into contact with the ratchet teeth by a spring *G*. A pin *H*, fastened to the shaft of pawl *E*, is fitted into a slot in the pawl-retaining cylinder. By extracting the pawl and turning it through an angle of 90 degrees, the pin can be removed from the slot and rested on the edge of the cylinder, thus stopping the feeding movement.

The brake assembly at the other end of roller *A* consists of the split brake-shoe *J* and brake-band *K*, Figs. 2 and 5. A screw *L* and nut *M* permit adjusting the amount of friction between the brake-shoe *J* and the shaft extension of roller *A*. A stud *N*, fastened to the side plate *B*, retains the brake assembly and extends through brake-band *K*, providing means for retaining adjusting screw *L*.

Above roller *A* is a pressure roller *O*, Fig. 1, supported by two bars *P*, which, in turn, are pivoted on studs *Q* in side plates *B*. Bars *P* have slots in them in which the weight *R* is supported by screws *S*. The sheet material is thus subjected to an adjustable pressure which forces it down on feeding roller *A*, so that a good grip is assured.

The feeding mechanism is actuated by a connecting-rod *T*, fastened to the floating plate *F* and connected to the press punch-head *I* through the offset arm *V*, which is attached to the extension rod *W* by pin *X*. Rod *T* has adjusting lock-nuts *Y* for synchronizing the ratchet feeding mechanism with the reciprocating motion of the press punch-head.

Design of Corrugating Punch and Die

The punch *Z* has a sliding fit in the retainer box *U*, fastened to the punch-head *I*. The spring washer resting on punch *Z*, together with a projection on punch-head *I*, serves to center the spring in the retainer box. The stationary primary punch *a* and the plate-holder bar *b* are retained in position by screws *c*, which extend through slots in the punch *Z*. This permits free vertical movement of the punch and at the same time restrains it from any lateral movement.

The die-block *d*, fastened to table *C*, carries the die *e*, together with the primary die parts *f* and *g*. The three die members are held in position by screws. Sheet-carrying plates *h*, extending from the feeding roll to the die-block, are fastened to the latter member. A similar plate *i*, near the entering side of the feeding roll, is supported by an arrangement not shown in the illustration.

The spacing mechanism is supported by two end plates *j*, fastened to table *C*. Bearing blocks *k* fit a slot in each of the end plates. Springs *l* tend to force the bearing blocks against the adjusting screws which pass through the cover plates. The two bearing blocks *k* are connected by a rod *m* to which the spacing fingers *n* are fastened by pins. A lever *o*, pivoted on a stud shaft *r*, which is fastened to the end plate *p*, rests on the rod *m*. The spring wire pin *q* serves to keep lever *o* on rod *m*, and also limits the free motion of the lever. This arrangement, of course, is duplicated for the other bearing block.

Actuating head *s* is secured to punch-head *I* and operates lever *o*. The motion of the spacing finger *n*

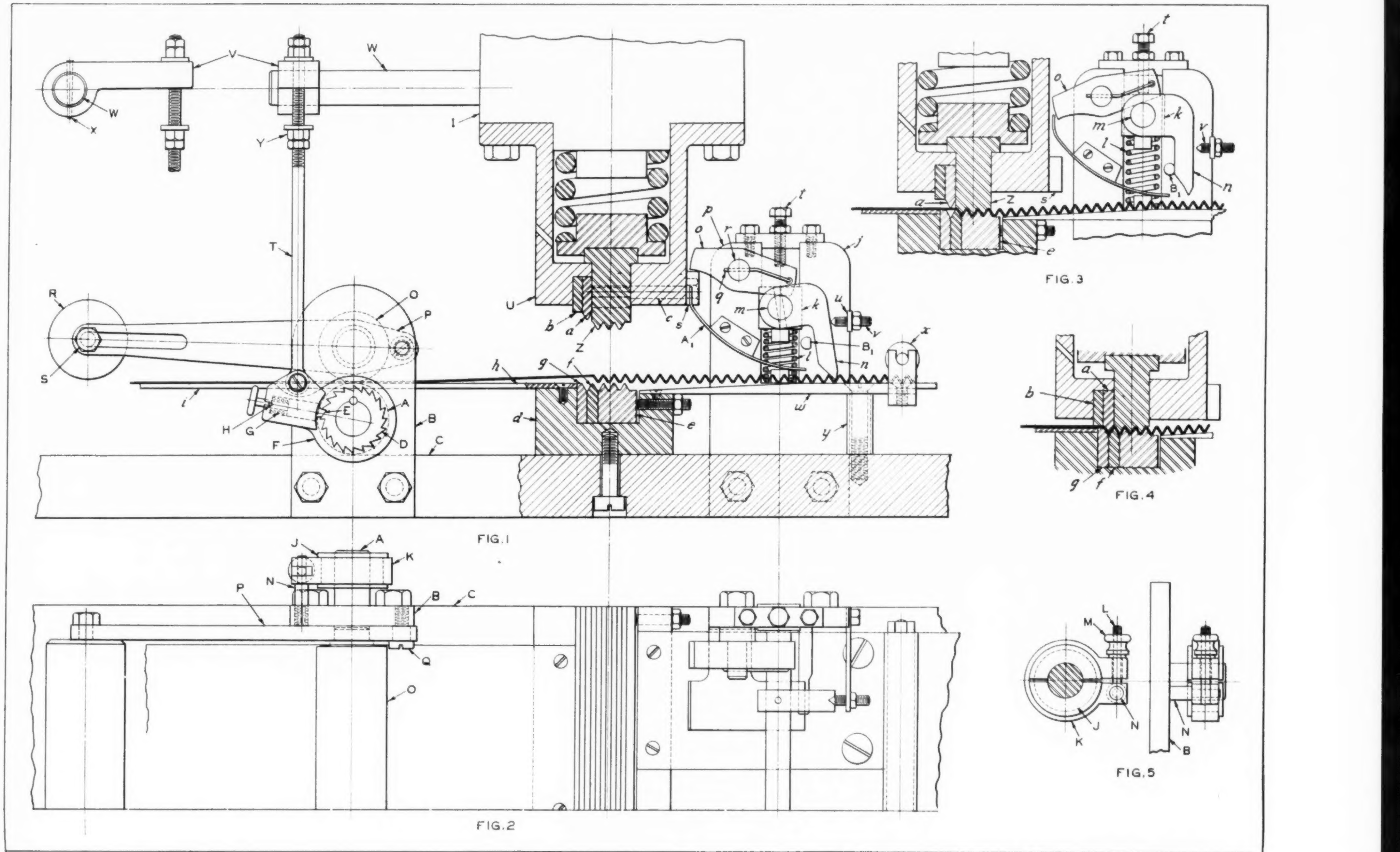


Fig. 1. Ratchet Feed Die Used on Press Brake for Continuous Corrugating of Thin Sheet Metal. Fig. 2. Plan View of Half of Lower Member of Die Shown in Fig. 1 Fig. 3. Punch Z and Die e Holding Work to be Formed by Punch a. Fig. 4. Punch a at End of Forming Stroke. Fig. 5. Brake Assembly for Controlling Roll A

is limited between the stationary stop B_1 and the adjustable stop consisting of the bracket u and an adjusting screw v.

Roller x keeps the corrugated plate in contact with plates w. The plates w are fastened to the die-block d and are supported from the table C by spacers y. A plate extends from the roller x and serves as a receiving table for the finished product. A deflector guide A_1, fastened to end plate j, keeps the corrugated plate down, particularly when the end of the material first leaves the dies.

The device is operated by the reciprocating punch-head I. The vertical motion is transmitted to pawl E by connecting-rod T. The nuts Y on rod T can be so adjusted that they will come in contact with the offset arm V at definite points in the machine stroke. As the pawl is moved from one tooth to the next, the braking mechanism serves to keep the ratchet in position until the movement is completed.

The functioning of the punch and die will be more readily understood by referring to Figs. 1, 3, and 4. In Fig. 1 the material is shown in place ready for the punch Z to descend, the punch-head I being shown at the upper extremity of its stroke. Fig. 3 shows the punch-head advanced far enough to press the corrugated material between punch Z and die e. Continued descent of the punch compresses the spring on punch-head I and causes the primary punch a to form a corrugation by forcing the material into the die members f and g, as shown in Fig. 4.

The plate-holding bar b flattens the sheet material and completes the upper corner of the corrugation. In producing the corrugations, punch Z and die e have no part in actually forming the material, but serve only to give a finishing touch to them. The primary punch a and the die members f and g, being the members subjected to the greatest wear, are made of special materials, and can be renewed without much difficulty or expense. The arrangement permits easy alterations if a variety of corrugation sizes are required.

Device Employed to Insure Accurately Spaced Corrugations

The spacing arrangement is an important part of the corrugating press. When the punch-head is at the lower end of its stroke, as shown in Fig. 3, the actuating heads s are no longer in engagement with levers o. As levers o are free, springs l raise rod m and the spacing fingers n until bearing blocks k rest against adjusting screws t. The shape of the spacing fingers is such as to cause them to pivot on bar m, so that they have a tendency to rest against stops B_1.

As the punch-head rises, the actuating heads s come in contact with levers o and depress bar m, which, in turn, lowers the spacing fingers until their points enter the corrugation. The spacing fingers remain in contact with stops B_1 and simply move in a direction at right angles to the corrugations. As the punch continues to rise it actuates the ratchet feeding mechanism and the material is moved forward a definite amount. However, in doing this, the spacing fingers n are carried forward until they come in contact with adjustable stops v, as indicated in Fig. 1. The position of the spacing fingers in the corrugated material and the stops B_1 insure moving the material only the desired amount. Any movement over the exact amount required is taken up by slippage between the feeding roller A and pressure roller O. The adjustable weight R is therefore located on bar P so that it will give a good grip on the material and still allow some slippage when necessary.

An important factor is the taper given the plates w. The distance between the feeding roller A and the roller x is comparatively short, and the material can be fed in a straight line between these two points, as indicated in Fig. 1. By keeping roller x above the level of the dies, the material will spring upward naturally and free itself from the die as punch Z rises. This makes it possible to move the material along easily. The taper given plates w is therefore necessary in order to guide the material from the die to roller x, and to lift the material from the die with the aid of its own resiliency. The use of the spacing fingers described made it possible to operate the press at a slightly faster rate and thus speed up production materially without impairing the quality of the product. However, careful synchronizing of the various elements is essential.

* * *

Savings Obtained Through the Use of a Suitable Cutting Solution

Remarkable savings obtained through improved machinery, tools, and accessories have been recorded many times in MACHINERY; but it should be pointed out that savings can also be effected by the use of the right kind of lubricating oils and cutting fluids. An example of savings made by the careful selection of a cutting fluid has been called to our attention.

In this case, rear-axle ring gears were being roughed out on a Gleason machine. The cutting fluid used, known as "Zeta Sol" solution, permitted 100 gears to be cut per grind, an increase of 15 per cent over results formerly obtained. The amount removed per grind was only 0.020 inch, so that the number of gears machined during the life of the cutter was 3500, an increase of about 45 per cent over the best results previously obtained. This reduced the cutter cost per 1000 pieces by \$4.72. The total cutter cost on forty-seven machines during a period of six months was reduced by \$2493—a very substantial saving. In addition, there was an even greater saving in the first cost of the cutting lubricant. These figures are quoted to indicate the importance of selecting cutting fluids with as much care as machines and cutting tools.

Welded Drill Jig for Engine Manufacture*

By WILBUR J. REICH and ERNEST M. KLUCK, Tool Designers
Worthington Pump and Machinery Corporation, Buffalo, N. Y.

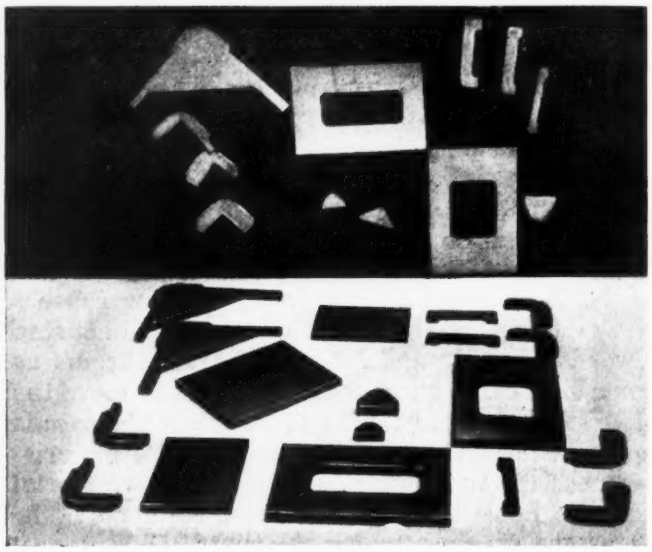


Fig. 1. By Using Templets of Heavy Paper (Shown in Background), the Various Pieces of a Jig are Gas-cut out of Machine Steel

IN making interchangeable parts for large engines of the type manufactured by the Worthington Pump and Machinery Corporation, extreme economy must be practiced in tooling, as products of this kind are not in everyday demand. Jigs and fixtures used in combination with an ordinary drilling, milling, or boring machine must take the place of special machines, whose original cost and high overhead make their use for low-volume production prohibitive. The use of arc welding enables jigs to be produced that are serviceable, highly adaptable to new or revised designs, and simple to construct. Substantial economies result from the elimination of patterns, foundry equipment, and the time necessary to produce a casting.

*From an award study submitted to the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, in a recent Award Program.

Evidence of the savings afforded by this method of construction is indicated in the arc-welded drill jig for an exhaust elbow shown in Fig. 2. This jig is one of many that have been manufactured each year for various sized engines. Full-size templets of ordinary heavy paper are used, and the machine-steel plates are gas-cut to templet form prior to welding, as shown in Fig. 1. The ease of joining these parts to form the assembled jig is clearly indicated by the simplicity of the welds, which are plainly marked in Fig. 2.

Cost comparisons between jigs of the cast and the arc-welded construction indicate a considerable saving for the latter:

Arc-Welded Jig

Material		
Steel Plate		$6.20
Pre-Machining Operations		
Welding	$12.00	
Normalizing	2.40	
Sand-Blasting	2.00	16.40
Machining		38.50
		$61.10

Cast-Iron Jig

Material		
Pattern	2.00	
Cast Iron	1.50	3.50
Pre-Machining Operations		
Pattern Labor	25.00	
Molding	4.00	
Chipping and Cleaning	4.25	
Normalizing	2.40	35.65
Machining		38.50
		$77.65

The simplicity of design and speed in construction obtainable by arc welding are of vital importance in tool engineering. For example, in a case

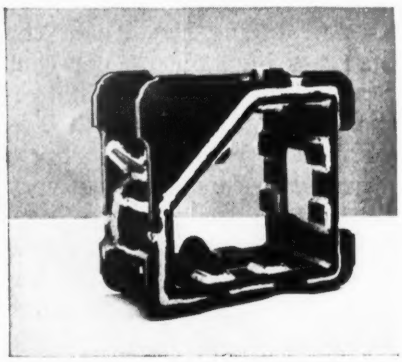
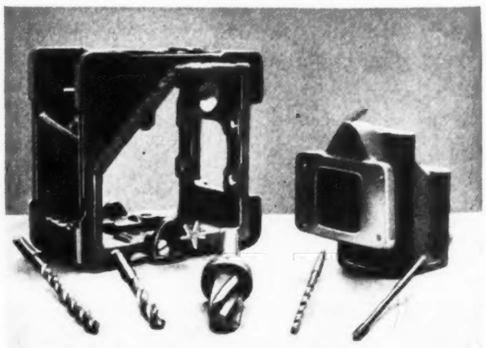


Fig. 2. The Welds (Plainly Marked in Left View) are Quickly and Easily Made. The Completed Jig (Right View) is Shown with Exhaust Elbow, and Drills and Tap Used



where it is necessary to construct a jig or fixture quickly for several pieces of one kind that may have been overlooked in the original tool set-up, often all that is needed is a rough sketch, which is sent to the welding shop, where the jig is made up from a few pieces of steel plate arc-welded together. Here, indeed, "time is money," and the ability of arc welding to keep pace with production is effectively demonstrated.

An engineering change in the product or a new design often requires changes in jigs and fixtures which must sometimes be made in a limited time. It is then that arc-welded fabrication proves of great advantage. Thus a lug, bushing plate, or locating device welded to the original jig makes it adaptable to the new part, thereby resulting in a saving both in time and money.

"Something pleasing to look at" does not apply to art alone, but finds its counterpart in tool engineering. Smooth finish and joints, rounded corners, intricate shapes cut and fabricated, are all readily obtainable with arc welding, and tend to produce a tool that is well balanced and of attractive appearance.

* * *

Plastics will Play an Important Part if Metals Become Scarce

It has been repeatedly pointed out that the tremendous load now being placed on this country's capacity to produce non-ferrous metals can be met to a considerable degree by the use of plastic materials. Molded plastics can take the place of non-ferrous metals for many purposes. Furthermore, no finishing operations are required for plastic parts. Compared with metals, plastics are light, they are corrosion-resistant, and they have comparable structural and impact strength. In addition, they provide excellent electrical insulation; and, what is most important, it is not likely that there will be any shortage in the materials used in the manufacture of plastic compounds. Obviously, when a substitution is suggested, the individual requirements must be carefully considered.

* * *

Fluorescent Luminaires for High-Level Lighting

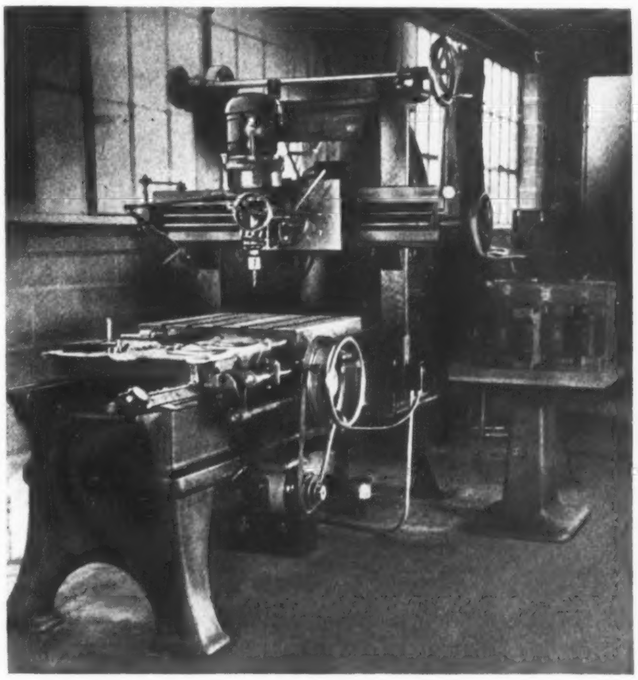
A new fluorescent luminaire employing two of the recently announced 100-watt, 60-inch, white or daylight fluorescent lamps, and designed especially for general and supplementary high-level illumination in industrial plants or areas, has been brought out by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These lamps are available for operation on 110-125, 199-216, and 220-250 volts, 60-cycle, alternating-current circuits. The luminaire or fixture consists of a hood, reflector, lamp-holders, starting device, and ballast equipment.

Converting Old Machine Tools to New Uses

By V. SMYRNOFF

At the present time, when the delivery dates on certain types of machines are very far ahead, and when the national emergency demands that every machine available be put to its best use, the adaptation of old machine tools to new uses is of considerable importance.

An interesting example is furnished by the conversion of an old planer into a jig borer at the S & B Machine Shop, Belleville, Mich. By remachining some of the old parts and adding a few new parts, a Bridgeport "Master Head" was applied to the planer, converting it into an acceptable



A Planer Converted into a Jig Borer by Adding a New Head, as well as Built-in Scales on the Cross-rail and on the Bed, and by Using Accurate Indicators and Measuring Rods

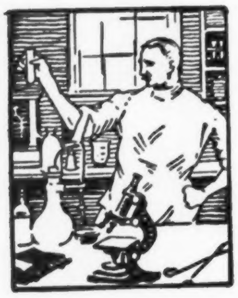
jig borer. Built-in scales were added on the cross-rail and on the bed. Thus it was possible to hold the accuracy within 0.002 inch; and by using an indicator reading to 0.0001 inch, in conjunction with accurate measuring rods, it was possible to hold the accuracy to within 0.0002 inch, and in some instances even closer.

Where such adaptation of old machines to new uses can be made, it is a definite contribution to the Defense Program.

* * *

In the present emergency, everyone realizes that the Government must pay its expenses through taxes; it is the cumbersome, inequitable, burdensome methods of tax collection intelligent men object to.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

"Speed Case"—A Free-Machining Open-Hearth Steel

A specially processed, low-carbon, open-hearth, case-carburizing steel known as "Speed Case" has been developed by W. J. Holliday & Co., Hammond, Ind., to meet the need for a steel with the machinability of S A E 1112 and X1112 Bessemer screw stock and the strength of such open-hearth steels as S A E 1020, X1020, X1314, and X1315.

This steel has the following analysis: Carbon, 0.10 to 0.20 per cent; manganese, 1.10 to 1.45 per cent; phosphorus, 0.03 per cent maximum; sulphur, 0.20 to 0.30 per cent; and silicon, 0.02 per cent maximum. The high sulphur content, as compared with customary open-hearth steels, makes dry machining of this steel possible, although the sulphur is not present in sufficient quantities to cause red-shortness or brittleness.

"Speed Case" is said to offer the following advantages: High-speed machining; greatly increased tool life; smooth finished parts; high physical properties; excellent impact resistance; good torsional values; high casehardness; great core toughness; reduced carburizing time; unusual ductility; minimum distortion; and a low magnetic coefficient. It can be cut at surface speeds of 220 to 300 feet per minute, and even at these speeds, it has been found that tool life is from five to fifteen times that expected for open-hearth steels.

The new steel has been found suitable for all types of broaching operations, and, because of its inherent freedom from tearing, makes possible a very clean surface. It makes sound forgings, and after forging, can be machined rapidly. Cold-forming, cold-heading, rolling, or crimping can be readily performed because of its toughness, and it will not split or crack under the most severe operations of this kind. "Speed Case" has also been found excellent for non-magnetic uses. It lends itself readily to welding, either by the electric arc or gas process.

"Speed Case" is available in hot-rolled plates having thicknesses of from 1/4 inch to 8 inches and standard widths; hot-rolled, forged, and cold-finished round bars; cold-drawn flats, squares, and hexagons; and standard-sized billets..........201

Heavier Brass Plating Made Possible by a New Process

A method has recently been developed by E. I. du Pont de Nemours & Co., Wilmington, Del., that makes it possible to perform brass-plating operations two to four times as fast as with previous processes. The new method enables heavy deposits of brass, 0.001 inch or more in thickness, to be made in a reasonable time where heretofore heavy deposits could not be obtained at all.

The relatively low temperature of operation, 40 to 50 degrees C. (approximately 105 to 125 degrees F.), assures ease of control and economical operation. Freedom from polarization at high anode current densities insures the continued purity necessary for the efficient operation of the bath. A uniform bright yellow color can be obtained over a wide range of current densities, so that uniform color over recessed objects is now possible. The characteristics of the deposit may be constantly maintained throughout the process by means of definite chemical control. Prepared, high-speed brass salts which will plate immediately eliminate any "breaking-in" period. Addition agents prevent pitting, improve luster, and obviate objectionable fumes.

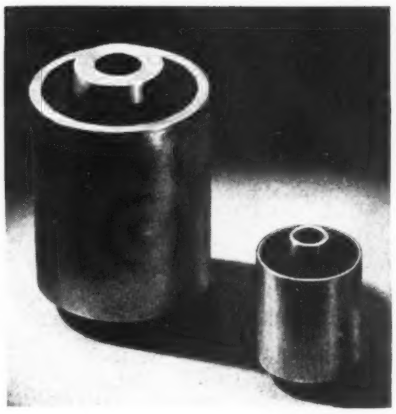
It is expected that, with heavy deposits now economically possible, the thickness of brass plating will undoubtedly be specified in the future, as is common practice with other electro-deposited metals. The purchaser of brass-plated objects will then be able to order according to specifications, and know definitely what brass plating deposit he will receive. 202

Durez 1910—A High-Impact Molding Compound

Durez 1910 is the third in a series of high-impact phenolic molding compounds recently developed by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. This material contains graphite, and has been developed especially for such applications as bumper shoes, refrigerator lock-bolts, and other

To obtain additional information about materials described on this page, see lower part of page 160.

Vibration- and Shock-absorbing Mountings Designed for Aircraft Utilize Two Stainless-steel Tubes Separated by a Wall of Neoprene, which Provide Resistance to Ozone, Oil, and Salt Air



parts where minimum frictional resistance is desirable. Durez 1910 has a particle size comparable to dry rice. It preforms easily, and flows readily through standard feeders, in contrast with previous impact materials of this type having a fluffy consistency that makes them difficult to handle in feeders and hoppers. This new molding compound has a specific gravity of 1.45, and a bulk factor of 3.6 to 1. 203

Two Coating Materials for Foundry Patterns

Two new coating materials have been developed by the Tamms Silica Co., 228 N. LaSalle St., Chicago, Ill., for use in the foundry. One, known as "Patternseal," is a compound for sealing and coating match plates, core-boxes, etc. It forms a protective coating which prevents moisture penetration and permits patterns to be used without employing a parting compound. It can be applied over plates that have been shellacked, as well as on wooden patterns. Usually one application lasts for a full day's run.

The other new coating material—"Metaline"—is a liquid metal compound designed to coat and seal wax fillets and gates preparatory to the use of Patternseal. It can be applied as a heavy coat over small pin-holes in metal patterns or around edges for thin fillets. It will also be found useful as a bond between two surfaces, such as between metal hand patterns and metal or wooden plates. It is claimed that Metaline eliminates about 50 per cent of the hand-soldering usually required on metal plates. 204

Neoprene and Stainless Steel Used in Aircraft Engine Mountings

A new line of aircraft engine and cowl vibration- and shock-absorbing mountings in which Neoprene is employed to resist oil and ozone attack at high altitudes, and 18-8 stainless steel to resist the corrosive effects of salt air at low altitudes, has been developed by Harris Products Co., 5424 Commonwealth Ave., Detroit, Mich.

The method of manufacturing these "Torflex" engine and cowl mountings provides a mechanical rather than a chemical bond between the Neoprene and the stainless steel, and makes possible capacity ratings of approximately 150 pounds per square inch axial load The process also permits the manufacture of special sizes or small quantities at low cost. While originally designed for aircraft use, the mountings are also available for industrial applications where operating conditions require both Neoprene and stainless steel.

The process of manufacture consists essentially of stretching a tube of seamless Neoprene between inner and outer tubes of stainless steel and then permitting the Neoprene to resume its initial state. The force exerted by the Neoprene in contracting lengthwise provides sufficient radial pressure to form a high-capacity mechanical bond between the Neoprene and both inner and outer stainless-steel tubes. 205

A Porcelain for Electric Insulation that Combines Strength and Low Cost

A new type of porcelain for electrical insulation, combining the low cost and high dimensional fidelity of dry-process porcelain with the superior electrical and mechanical properties of wet-process material has been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The new porcelain, known as "Prestite," has a dielectric strength equal to that of wet-process porcelain, and a mechanical strength about 10 per cent greater under tension and cantilever loads. It is impervious to moisture, and has the same resistance to heat shock as other types of porcelain. Particularly adaptable for intricately shaped pieces, the dimensions of Prestite can be held accurate within 1 1/2 per cent. This deviation is only half that normally allowed in equivalent wet-process pieces and about the same as for dry-process parts.

Since wet-process porcelain is not adaptable to the production of intricate parts, these are normally formed by the accurate dry process, which, however, yields an electrically and mechanically inferior product. For a given dielectric strength, a Prestite part can be made about a third the size of the equivalent dry-process piece; for the same mechanical strength, size reduction varies from about 10 to 30 per cent, depending on the kind of load carried. The cost will be less than for wet-process porcelain, but slightly greater than for dry-process porcelain. 206

To obtain additional information about materials described on this page, see lower part of page 160.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Fill in on Form at Bottom of Page 159 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the March Number of MACHINERY

Indicating, Recording, and Control Equipment

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Catalogue 9400, on Brown "New-Matic" remote transmission for use where explosion hazards are involved. Catalogue 15E, descriptive of Brown pyrometers of the millivoltmeter and other types. 1

Automatic Lathes and Turret Lathes

GISHOLT MACHINE CO., 1209 E. Washington Ave., Madison, Wis. Performance Data Sheets Nos. 66 to 69, giving actual production data, including feeds, speeds, and production time, on four different jobs performed on Gisholt automatic lathes and turret lathes. 2

Oils for Internal-Combustion Engines

LUBRI-ZOL SALES CO., Cleveland, Ohio. Catalogue entitled "Additives for the Improvement of Motor Oils," containing tabulated data showing the effect of treatments on the properties of oils such as are used in commercial automotive, Diesel, and aviation engines. 3

Perforating Dies

STRIPPIT CORPORATION, Buffalo, N. Y. Circular on Type A perforating dies for use on templets in presses or on adapters in press brakes. Circular on Type B perforating dies for use on templets, T-slotted plates in presses, or adapters in press brakes. 4

Hobbing and Hob-Sharpening Machines

BARBER-COLMAN CO., 203 Loomis St., Rockford, Ill. Data Sheet No. 15, containing production data on the Barber-Colman No. 3 hobbing machine. Data Sheet No. 16, describing the advantages of the No. 3 hob-sharpening machine. 5

Milling Machines

SUNDSTRAND MACHINE TOOL CO., 2530 Eleventh St., Rockford, Ill. Bulletin illustrating and describing the Sundstrand No. 00 hand-feed Rigidmil, designed for easy conversion to a power-feed machine. Bulletin descriptive of Sundstrand No. 00 hydraulic Rigidmil. 6

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletins GEA-2234C, on manual motor-starting switches; GEA-3469, on push-button stations; and GEA-1918B, on tellurium portable cable for portable electric machinery. 7

Oil Filters

MOTOR IMPROVEMENTS, INC., Newark, N. J. Oil filter dictionary, containing a list of words and phrases used in connection with oil filtering and their definitions, as well as symbols and abbreviations. 8

Die Steels

CRUCIBLE STEEL CO. OF AMERICA, 405 Lexington Ave., New York City. Folder describing the properties and features of the high-carbon, high-chromium die steels made by this company; includes hardening and tempering data. 9

Die and Mold Duplicating

DETROIT UNIVERSAL DUPLICATOR CO., 227 St. Aubin St., Detroit, Mich. Folder entitled "Low-Cost Die and Mold Duplicating," showing various applications of the Detroit universal duplicator control on turret lathes, planers, shapers, millers, etc. 10

Tantalum-Carbide Tools

FANSTEEL METALLURGICAL CORPORATION, North Chicago, Ill. Folders containing data on Tantung Grade G solid tool bits for general-purpose cutting, and "Economy" tools provided with a Tantung bit brazed to a steel shank. 11

Welding Positioners

CULLEN-FRIESTEDT CO., 1305 S. Kilbourn Ave., Chicago, Ill. Bulletin WP-20, containing complete information on this company's line of welding positioners, together with illustrations showing various applications. 12

Precision Grinding Machines

FITCHBURG GRINDING MACHINE CORPORATION, 1601 Walnut St., Fitchburg, Mass. Catalogue illustrating and describing Fitchburg multiple precision grinding machines and special applications on national defense work. 13

Potentiometer Recorders

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Circular descriptive of a new "daily tear-off" device for Micromax recorder strip charts, which makes the charts as easily filed as round charts. 14

Special Mechanisms for Grinding and Lapping Machines

NORTON CO., Worcester, Mass. Catalogue 1759-1P, illustrating and describing special devices and mechanisms for standard Norton grinding and lapping machines. 15

Gun-Barrel Machinery

PRATT & WHITNEY DIVISION NILES-BEMENT-POND CO., West Hartford, Conn. Circular 454, illustrating and describing gun-barrel chambering machines. Circular 455, on gun-barrel rifling machines. 16

Electric Air Cleaner

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Folder F-8501, entitled "Dirt is a Critical Hazard," describing the application and operation of the Precipitron electrostatic air cleaner. 17

Small Tools

STANLEY TOOLS, New Britain, Conn. Catalogue 50, showing typi-

cal examples of Stanley tools for use in industrial production and maintenance work, including some that are especially suitable for the aircraft industry. 18

Nickel Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin T-19, containing technical information on the deep-drawing, shearing, and perforating of Monel, nickel, and Inconel. 19

Grinding Cemented-Carbide Milling Cutters

CARBOLOY COMPANY, INC., 11147 E. Eight Mile Ave., Detroit, Mich. Bulletin GT-127, containing complete instructions for grinding cemented-carbide milling cutters. 20

Screw Machines

FOOTE-BURT CO., Cleveland, Ohio. Circular 511, illustrating and describing "Footburt" automatic single-spindle 1- and 1 1/2-inch screw machines with speed ranges suitable for high-production tools. 21

Meehanite Castings

MEEHANITE RESEARCH INSTITUTE OF AMERICA, INC., 311 Ross St., Pittsburgh, Pa. Booklet entitled "Meehanite in Industry," describing applications of Meehanite castings in a wide variety of industries. 22

Flexible Bearings

HARRIS PRODUCTS CO., 5424 Commonwealth Ave., Detroit, Mich. Folder describing Torflex flexible bearings in which a rubber tube is incorporated, which eliminates noise and vibration and reduces shock. 23

Electric Drives

RELIANCE ELECTRIC & ENGINEERING CO., 1088 Ivanhoe Road, Cleveland, Ohio. Bulletin 310, describing an all-electric, adjustable-speed drive for alternating-current circuits, intended for small units. 24

Hydraulic Straightening Machines

A. B. FARQUHAR CO., LTD., York, Pa. Bulletin 40-H-01, descriptive of Farquhar hydraulic gun and shaft straightening and general-purpose presses. 25

Power Squaring Shears

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 72, covering the new Niagara No. KL-18 power squaring shear. 26

Materials-Handling Equipment

CONTINENTAL-DIAMOND FIBRE CO., Newark, Del. Catalogue HW, descriptive of boxes, trucks, barrels, baskets, etc., made from Diamond vulcanized fiber hollow ware. 27

Blueprinting Machines

C. F. PEASE CO., 2601 W. Irving Park Road, Chicago, Ill. Circular illustrating and describing the Pease 22-16 combination blueprinting, washing, and drying machine. 28

Speed Control for Machine Tools

REEVES PULLEY CO., Columbus, Ind. Booklet G-410, on Reeves variable-speed control for machine tools, showing typical installations and giving production details. 29

Gages and Dial Indicators

B. C. AMES CO., Waltham, Mass. Catalogue 52, illustrating and describing Ames gages and dial indicators for measuring, size control, and general testing. 30

Overhead Tramrail Systems

CLEVELAND TRAMRAIL DIVISION OF THE CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio. Circular 2006-A, descriptive of the Cleveland tramrail raise-lower cab carrier. 31

Electric Hoists

SHEPARD NILES CRANE & HOIST CORPORATION, Montour Falls, N. Y. Catalogue 127, containing information on Shepard Niles electric hoists, including engineering data. 32

Ampco Safety Tools

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee, Wis. Folder describing Ampco non-sparking safety tools, designed to provide protection against fire and explosion. 33

Gas and Air Regulators

ALEXANDER MILBURN CO., 1410 W. Baltimore St., Baltimore, Md. Special portfolio describing Milburn gas and air regulators of the single- and two-stage ball-seat type. 34

To Obtain Copies of New Trade Literature

listed on pages 158-160 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

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Business Address ....

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Silent Chain Drives

LINK-BELT Co., 307 N. Michigan Ave., Chicago, Ill. Folder 1894, on Silverstreak 3/16-inch pitch silent chain drives for fractional-horsepower duty. Prices of both chain and wheels are included. 35

Planers

LIBERTY PLANER & MFG. Co., Hamilton, Ohio. Catalogue 152, describing in detail the latest designs of Liberty heavy-duty, fast operating planers. 36

Lock-Nuts

SECURITY METAL PRODUCTS, INC., 345 E. Kalamazoo Ave., Kalamazoo, Mich. Folder describing a new type of lock-nut, designed to withstand vibration. 37

Conveyors

AJAX FLEXIBLE COUPLING Co., Westfield, N. Y. Bulletin 31, giving complete information on the "Lo-Veyor," a vibrating conveyor for bulk materials. 38

Tachometers

HERMAN H. STICHT Co., INC., 27 Park Place, New York City. Bulletin 750, describing the new Standco universal type, direct-reading, hand tachometer. 39

Conveyor Furnaces

ELECTRIC FURNACE Co., Salem, Ohio. Reprint of an article entitled "Chain Belt Conveyor Furnaces—Their Design, Construction, and Application." 40

Grinding Wheels

NORTON Co., Worcester, Mass. Folder entitled "Sparks," containing a chart of sparks generated by grinding wheels and a table showing the significance of the different kinds of sparks. 41

Monarch Bearing Metal

MONARCH ALLOYS Co., Ravenna, Ohio. Circular entitled "Don't Lose Your Bearings!" describing a new bearing metal and its physical properties. 42

Brazing Sintered Carbide

FIRTH-STERLING STEEL Co., McKeesport, Pa. Catalogue descriptive of the Firth Braze-Rite furnace for brazing sintered carbide. 43

Milling Machine Attachments

PORTER-CABLE MACHINE Co., Syracuse, N. Y. Circular containing data on Porter-Cable universal milling machine attachments. 44

Arc Welding Equipment

LINCOLN ELECTRIC Co., Cleveland, Ohio. Application Sheet No. 72, describing the application of welding in press design. 45

Carburizing Furnaces

GENERAL ELECTRIC Co., Schenectady, N. Y. Bulletin GEA-3523, on gas-carburizing electric furnaces. 46

Vises

DESMOND-STEPHAN MFG. Co., Urbana, Ohio. Catalogue listing the Simplex complete line of steel-slide vises. 47

Shaft Seals

FULTON SYLPHON Co., Knoxville, Tenn. Bulletin 825, on Sylphon shaft seals designed to prevent leakage of gas or liquid. 48

Stackbins

STACKBIN CORPORATION, Providence, R. I. Catalogue 500, containing information on the Stackbin system of storing parts. 49

Clutches

CONWAY CLUTCH Co., 1507 Queen City Ave., Cincinnati, Ohio. Bulletin MGT, on gear-tooth drive disk clutches of medium sizes. 50

Gas Cutting Machines

HARRIS CALORIFIC Co., Cleveland, Ohio. Circular illustrating and describing Model K portable gas cutting machines. 50-A

Speed Reducers

D. O. JAMES MFG. Co., 1120 W. Monroe St., Chicago, Ill. Folder illustrating and describing motorized speed reducers. 50-B

Shock-Resisting Tool Steel

JESSOP STEEL Co., Washington, Pa. Folder describing Jessop "Top Notch" shock-resisting tool steel. 50-C

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 161-173 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description on pages 161-173—or write directly to the manufacturer, mentioning machine as described in March MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

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To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 156-157 fill in below the identifying number found at end of each description on pages 156-157—or write directly to the manufacturer, mentioning name of material as described in March MACHINERY.

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[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

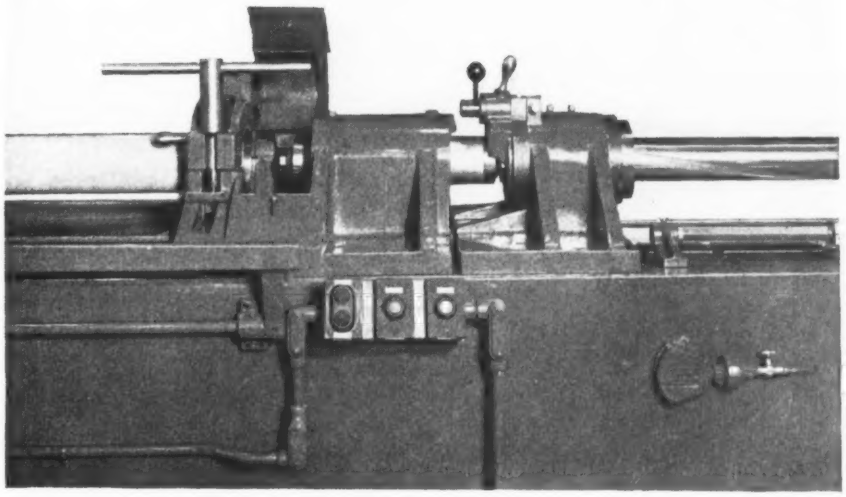


Fig. 1. American Hydraulic Gun-broaching Machine with Hinged Guard Raised to Show Cutter on Quill Ready to Enter Bore

American Hydraulic Gun-Rifling Machine

The hydraulic gun-rifling machine shown in Figs. 1 and 2 is a recent development of the American Broach & Machine Co., Ann Arbor, Mich. This machine is designed and equipped for the accurate production rifling of 105-millimeter howitzer barrels. All the thirty-six constant-pitch spiral grooves of this type barrel are broached to a depth of 0.030 inch simultaneously on this machine. A series of twenty-four cutters is run through the rifle barrel in sequence. Each cutter removes slightly more metal from the grooves than the preceding cutter. The over-all length of the barrel is 93 inches, and the bore 4.134 inches. The approximate time required for the complete groove-broaching operation is 1 1/2 hours.

The barrel to be rifled is located in the machine at the muzzle end by a manually operated clamp and support block. The breech end is located by a similar clamping block mounted on the machine bed. End thrust during the cutting operation is taken by the tailstock mounted at the left-hand end of the machine bed. The work is clamped between split bushings, which are left soft in order to protect the external surface of the barrel. The cutting action is directed from the muzzle to the breech end of the barrel.

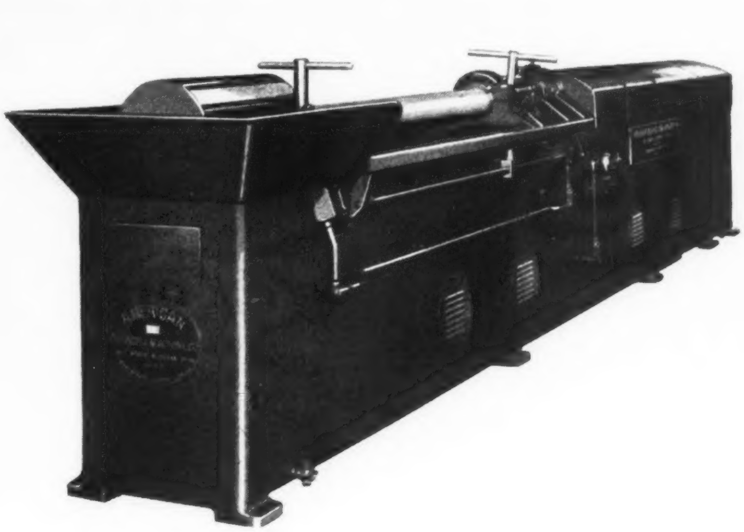


Fig. 2. Hydraulic Gun-broaching Machine with Work Locked in Split Fixture Clamps

After the cutter has been mounted on the quill and locked in position, as shown in Fig. 1, the operator drops the guard and starts the machine. At the end of the stroke, the machine is stopped and the coolant shut off automatically. The operator then lifts the guard, removes the cutter, and returns the bar to its original starting position. This operation is then repeated, using the next size cutter.

The rifling machine is similar in construction to the standard hydrau-

To obtain additional information on equipment described on this page, see lower part of page 160.

lic broaching machines built by this company. It consists of a fabricated steel bed containing the hydraulic cylinder, oil reservoir, valves, piping, motor and motor controls, as well as the entire coolant system. The hollow master lead-bar permits a generous supply of coolant to be carried to the cutting tool. This lead-bar is driven laterally through a roller thrust bearing by the cylinder slide unit, and given the required spiral movement by an adjustable driving plate. The driving plate is also provided with a backlash take-up adjustment.

The driving plate unit is mounted in a casting integral with the quill support and front support for the part, in order to insure positive alignment for these three important members. The quill carrying the cutters is mounted, by means of a taper shank, in the end of the master lead-bar. The front end of the quill is provided with a U-washer to facilitate quick changing of the cutters. This entire drive mechanism is covered, as shown in Fig. 2, by a substantial metal shield which is provided with latched doors for accessibility.

The coolant from the reservoir at the left-hand end of the machine is carried to the cutter edge by means of a telescoping feed-tube. A sloping trough sealed to the column sides conveys the coolant to the sump, the machine guide-ways being effectively sealed against coolant wash or foreign matter. This machine is driven by a Sundstrand variable-delivery pump direct from the driving motor. An adjustable relief valve protects the mechanism against overloads.

The machine has a capacity of 12 tons, a cutting speed of 15 feet per minute, a return speed of 30 feet per minute, and a maximum stroke of 100 inches. The working height of the machine is 40 inches; the overall height 4 feet; and the floor space occupied 2 1/2 by 22 feet. The net weight is 24,000 pounds. A 15-H.P. motor having a speed of 1200 R.P.M., with across-the-line starter and separate push-button station, is required to operate the machine. 51

Sundstrand Rigidmils Designed to Handle Small Parts

The Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill., has recently brought out a smaller sized Rigidmil, designated the No. 00. This machine has a 3/4-H.P. spindle motor, and is designed for milling small parts. Two models are available, one with power feed and the other with hand feed.

The power-feed machine, shown in Fig. 1, has a hydraulically actuated table, the hydraulic equipment being designed and manufactured by the Pump Division of the Sundstrand Machine Tool Co. The hydraulic feed provides a wide range of automatically controlled table cycles, including two-way cycles and skip feed. Climb or conventional milling operations can be performed separately or in combination.

The table has a maximum stroke of 8 inches, and a rapid-traverse rate of 400 inches per minute. The feed and rapid-traverse strokes can be regulated to suit the work. Two feed ranges are available—one from 1/2 to 37 inches per minute, and the other from 1 1/4 to 66 inches per minute. Any desired feed within the range of the machine can be secured by adjusting a feed selector dial which furnishes a direct dial reading in inches per minute.

An outstanding feature of the machine is the wide range of spindle speeds possible, the ratio between the high and low speeds being 42 1/2 to 1. Heads are available in two models; the Model A provides speeds from 57 to 2415 R.P.M., and the Model B from 85 to 3600 R.P.M. The head is of the independently motor-driven type, and is so designed that one set of pick-off gears gives four speed changes, and the four sets of standard gears furnished with each machine supply sixteen possible speed changes. A separate motor drives the hydraulic unit. The machine is of unit type construction, and is provided with automatic lubrication for all moving parts.

The hand-feed machine, shown in Fig. 2, is constructed of the same basic units as the hydraulic-feed machine, and can be converted to power feed. The table movements of the hand-feed machine are controlled by a long lever. The length of stroke, with a 90-degree movement of the lever, is 3 3/16 inches. This stroke can be adjusted through a 10-inch range. For long movements of the table, a handwheel can be furnished in place of the hand-lever.

The head can also be fed vertically, the maximum length of stroke being 2 inches. This 2-inch stroke can be adjusted within a range of 8 3/8 inches. An adjustable counterbalance offsets the weight of the head, so that vertical movements are easily controlled. The travel of the head can be limited by a positive stop, which has a micrometer adjusting dial. The head can be accurately clamped in relation to the machine table when vertical movement is not required. This machine has the same high-speed, 42 1/2 to 1 ratio head as the power-feed machine. 52

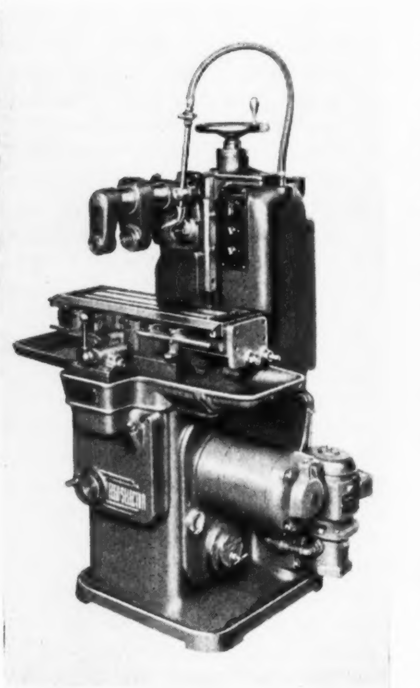
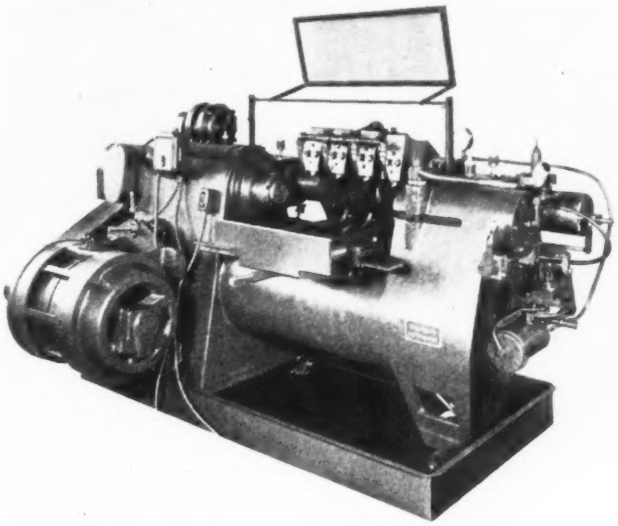
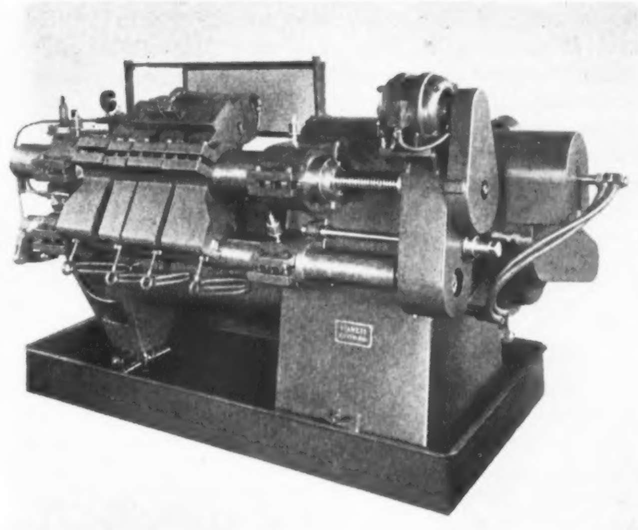


Fig. 1. Sundstrand No. 00 Rigidmil with Power Feed

Fig. 2. No. 00 Rigidmil Equipped for Hand Feed

To obtain additional information on equipment described on this page, see lower part of page 160.





Shell-turning Machine Brought out by William K. Stamets

Stamets Shell-Turning Machine

A single-operation type shell-turning machine which can be equipped with different tool set-ups for various operations has been brought out by William K. Stamets, Jenkins Arcade Bldg., Pittsburgh, Pa. This machine is intended for straight or form turning of shells in sizes up to 6 inches in diameter. It has a cylindrical bed, with the headstock cast integral and a separate tailstock bolted in position. The drive spindle is mounted in Timken bearings, and is driven by a helical gear and pinion with silent chain drive from the motor. The spindle is equipped with an air-operated expanding collet for driving the work.

The tailstock spindle is, in effect, the piston of an air cylinder, and carries a center mounted in Timken bearings. A clamping lever locks the tailstock spindle and also operates an air valve which controls both the tailstock spindle and the expanding collet, so that one motion of the lever advances the tailstock spindle, tightens the driving collet, and clamps the tailstock spindle.

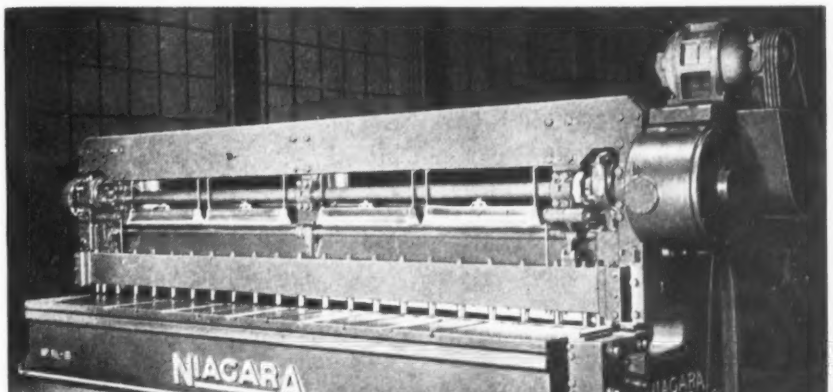
At the rear of the bed are two shafts, the upper shaft carrying rocker arms, and the lower one templets of the required contour. A roller at the lower end of each rocker arm engages the templet. The upper end of each rocker arm carries one or more cutting tools. The upper shaft is fed longitudinally by means of a screw driven by a worm and wheel geared to the spindle. Pick-off gears are provided for changing the feed. At the end of the feed stroke, the tools are automatically retracted and returned to the starting position.

The machine equipped for facing the base end and cutting off the shells consists of only two rocker arms actuated by cam-plates carried on the rear bar of the machine. The operation of roughing the outside diameter is performed by four tools that rock inward and travel approximately one-fourth the length of the shell. For finish-turning shells, practically the same set-up is used with cams arranged for machining the boat tail, bourrelet, and nose of the shell. Actual tests have shown that 155-millimeter shells can be either rough- or finish-turned at the rate of about twenty-five shells an hour.....53

Niagara Power Squaring Shear

A No. KL-18 power squaring shear having an 18-foot cutting length and a capacity for cutting 3/16-inch material has just been added to the line built by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. This new shear is designed for accurate flat cutting at increased production rates. It is equipped with a quick-setting, self-measuring, ball-bearing, parallel back gage, adjustable in increments of 1/128 inch.

All drive gears are mounted on anti-friction bearings, and are enclosed in an oil-tight case. The shear is controlled by means of a fourteen-point clutch that operates in a bath of oil. The illustration shows the shear equipped with fluorescent lights, which perform the dual function of illuminating the working surface of the bed and throwing a shadow line at the cutting line for convenience in shearing to a straight edge. A toggle-operated, independent



Niagara Power Squaring Shear with 18-foot Cutting Length

To obtain additional information on equipment described on this page, see lower part of page 160.

spring-pressure, foot hold-down provides a smooth and firm grip on sheets of varying lengths. The triangular box-section cross-head of steel construction provides for rigid mounting of the upper knife. An adjustable truss rod insures straightness of the knife throughout its length. 54

Minster Straight-Side and Inclinable Presses

The straight-side, double-crank press shown in Fig. 1, and the No. 7 open-back inclinable press illustrated in Fig. 2, will be among the new machines exhibited by the Minster Machine Co., Minster, Ohio, at the A.S.T.E. Show in Detroit this month.

The press shown in Fig. 1 has a rated capacity of 75 tons, is 54 inches between uprights, and has been developed to give long life, flexibility, and ease of operation. This press has an air-operated, synchronizing, multiple-disk, friction clutch and brake; 7-inch barrel type motorized slide adjustment; totally enclosed dip-lubricated gearing; and bronze-faced slide-ways.

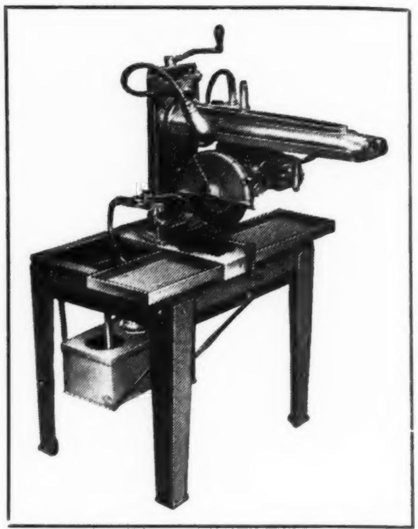
The No. 7 seventy-five-ton press shown in Fig. 2 is equipped with the Minster combination friction clutch and brake unit. In addition to the machines illustrated, the company will also exhibit a No. 3 twenty-two-ton press which is representative of its smaller line of inclinable presses. The entire series of inclinable presses comprises ten sizes, ranging in capacity from 12 to 106 tons. 55

Wallace Metal-Cutting Saw

J. D. Wallace & Co., 149 S. California Ave., Chicago, Ill., have recently developed a No. 1 metal-cutting saw for use in cutting bar stock, rounds, angles, tubing, and sheet metal of all kinds, as well as many refractory materials. In addition to straight cut-off work, this machine can be quickly set up for angle cuts and miters. For cutting simple or compound angles, the radial arm is adjusted and the work held in the vise on the adjustable carrier.

The high-speed geared type motor drive used is fitted with either 3/32-inch thick abrasive wheels or special metal-cutting saw blades which have a reciprocating feeding movement under the supporting radial arm. The saw will cut iron, brass, aluminum, duralumin, copper, high-speed steel, and all kinds of alloys.

The wheels and blades have a maximum cutting depth of 4 inches, and will handle work within the capacity of the 1- or 2-H.P. motors. The illustration shows the complete machine, including the coolant pump, vise-carrier, and rapid-acting vise. 56



Wallace Metal-cutting Saw with Reciprocating Head

Given "Vari-Speed" Motor Drive

A motor drive known as the "Vari-Speed," which provides positive, infinitely variable speeds within its ratio of 4 to 1, has been brought out by the Given Machinery Co., 2020

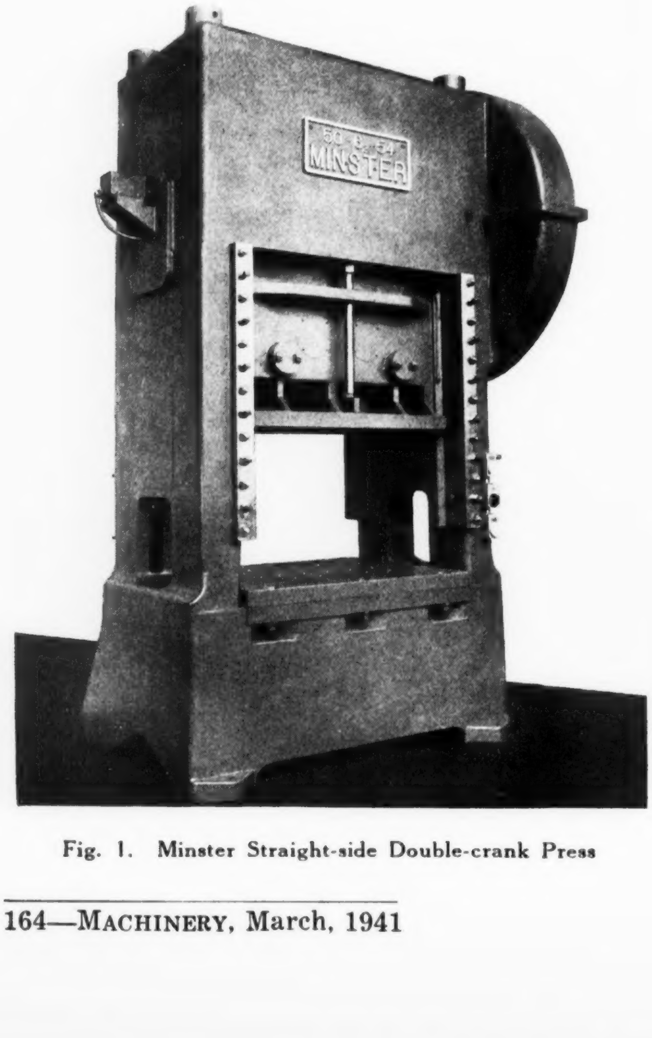


Fig. 1. Minster Straight-side Double-crank Press

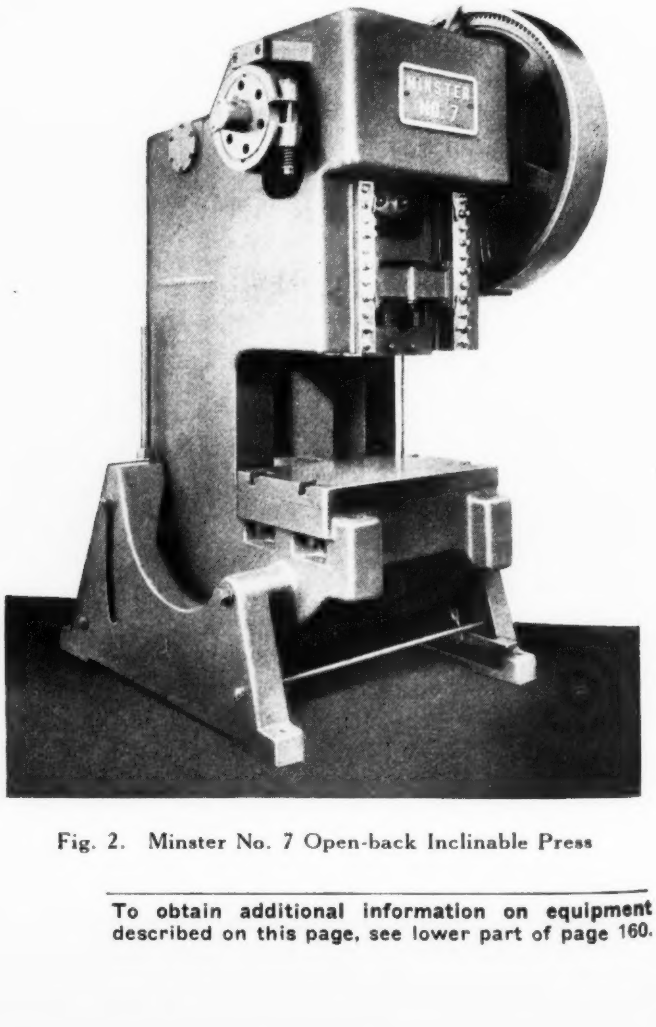
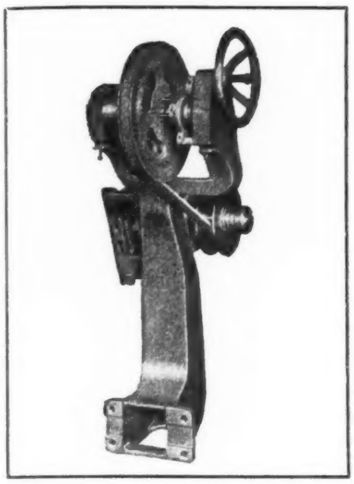


Fig. 2. Minster No. 7 Open-back Inclinable Press

To obtain additional information on equipment described on this page, see lower part of page 160.



"Vari-Speed" Motor Drive Built by Given Machinery Co.

Santa Fe Ave., Los Angeles, Calif., in sizes from 1 to 5 H.P. This drive permits instant regulation of spindle or cutting speeds to a fraction of a revolution per minute. A 16-inch, three-step, double back-geared lathe can be operated at from 20 to 710 R.P.M. with instantaneous adjustment of any speed within these limits to suit the requirements of the work being handled.

A large-diameter, single take-off pulley eliminates all belt shifting. Speeds can be changed while the machine is in operation through a handwheel. A one-piece frame, low center of gravity, and dynamically balanced pulleys with ground belt surfaces are features of this drive. Over-size, sealed ball bearings are used throughout. 57

Atlas Multiple-Spindle Drilling Machine

The Atlas Press Co., 253 N. Pitcher St., Kalamazoo, Mich., has brought out a new multiple-spindle drilling machine which is available with 1/2-inch Jacobs chucks or No. 1 Morse taper spindles, and with either two, three, or four spindles. These machines have four-bearing floating drives, designed to insure a smooth and sensitive drilling action. Each drill head is equipped with its own motor mounting, and an entirely new type of control which permits the head to be positioned as desired by a few turns of a crank-handle.

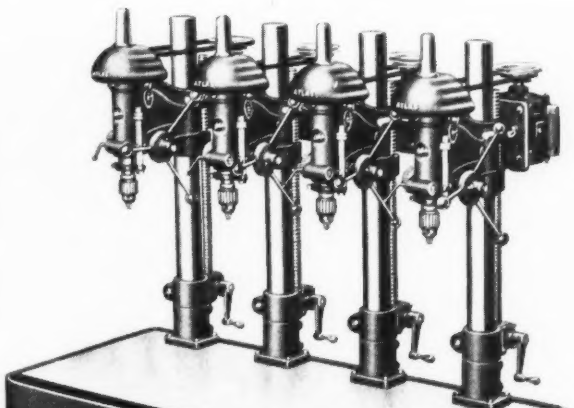
The massive production type table of the three- and four-spindle machines weighs 575 pounds alone, and the working surface of the table is precision-ground square with the drilling spindles. The floor legs are heavy iron castings, bolted to the table. The center distances between the spindles of the two-, three-, and four-spindle machines are 15, 18, and 13 inches, respectively.

The maximum distance from the table to the chuck is 26 inches, and from the table to the No. 1 Morse taper spindle 24 1/2 inches. The distance from the columns to the center of the spindle is 7 1/2 inches. The spindle travel is 4 inches. Nine speeds are provided within the range of 600 to 5200 R.P.M. The two-, three-, and four-spindle drilling machines weigh 650, 1020, and 1100 pounds, respectively. It is recommended that ball-bearing motors of 1/3 or 1/2 H.P. with a speed of 1740 R.P.M. be used with these machines. 58

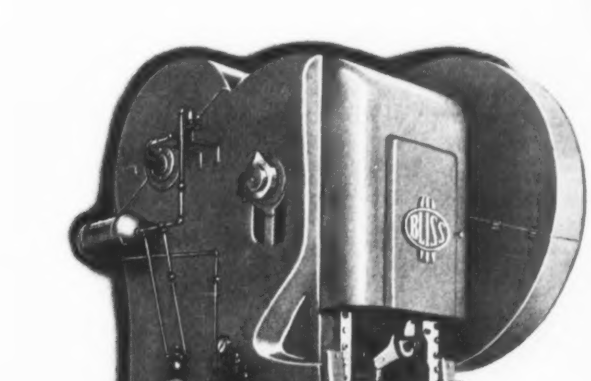
Bliss Inclinable Press

The Consolidated Press Division of E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y., has recently added to its line of inclinable presses a machine of larger size and capacity. This new press, known as the Bliss Consolidated No. 10, has the gearing and other working parts enclosed. It is a general-purpose machine with strokes ranging from 8 to 12 inches. The bed is 35 inches front to back by 53 inches left to right.

A hammer-forged crankshaft made



Atlas Four-spindle Drilling Machine



Bliss Consolidated No. 10 Inclinable Press

To obtain additional information on equipment described on this page, see lower part of page 160.

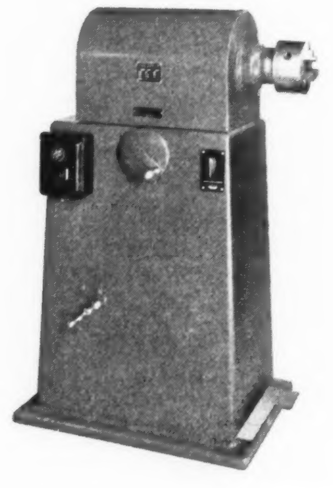
of a special grade of steel, and a large-area flanged slide are notable features. The press frame casting is of semi-steel. 59

"Load King" Hydraulic Hand Lift-Truck

The Yale & Towne Mfg. Co., 4530 Tacony Ave., Philadelphia, Pa., has developed a carefully balanced, hydraulic, hand lift-truck known as the "Load King." Outstanding improvements claimed for this new truck include easier lifting and steering, greater safety for the operator, lower maintenance costs, and full control when lowering loads.

The one-piece frame serves the double purpose of elevating platform and elevating frame. Large Timken thrust bearings are provided on the steering column. The wheels on standard models are smooth, machine-faced steel, equipped with ball bearings, sealed to exclude dirt and other foreign matter. A full 200-degree lifting and steering arm facilitates maneuverability. This truck is built for continuous, heavy-duty service in capacities of 3500, 5000, 6000, and 8000 pounds. 60

"Load King" Hydraulic Hand Lift-truck Built by the Yale & Towne Mfg. Co.

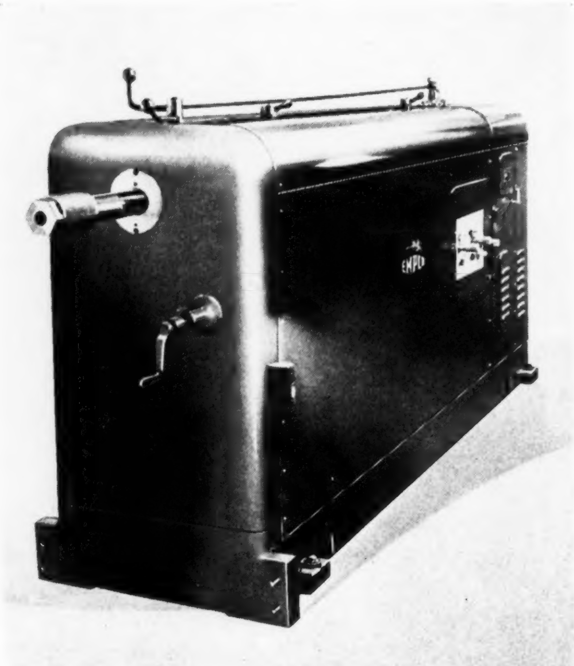


Schauer Variable-speed Lapping and Polishing Lathe

Enterprise Horizontal Honing Machine

A honing machine of the horizontal type that will accommodate work requiring a stroke up to 57 inches has been brought out by the Enterprise Machine Parts Corporation, 2731 Jerome Ave., Detroit, Mich. This type of machine can be built in special models to provide for longer strokes. It is claimed that cooling of the work is facilitated by the horizontal positioning of the honing spindle, and that work can be held to size within 0.0002 inch.

The machine takes any type of work from 2 to 12 inches in diameter, producing round, straight, mirror-finish holes and eliminating taper and out-of-roundness. All controls are operated mechanically. Withdrawal of the honing tool is accomplished by means of a handwheel. The seven spindle speeds range from 50 to 200 R.P.M. This speed range, however, can be changed, but the ratios remain constant. The over-all height is 54 inches, and the length 110 inches. The height of the spindle above the floor level is 40 inches. 61



Horizontal Honing Machine Brought out by Enterprise Machine Parts Corporation

Schauer Variable-Speed Lapping and Polishing Lathe

Speeds as low as 20 R.P.M. for lapping gages and other parts, as well as ample power for rotating heavy work at speeds up to 4000 R.P.M. for performing final finishing operations such as filing, burring, or polishing, are obtainable on the new variable-speed lathe brought out by the Schauer Machine Co., 2063 Reading Road, Cincinnati, Ohio. If desired, an adjustable slippage arrangement between the motor and the spindle can be furnished to control the pressure of the lap on the work. This lathe is equipped with a quick-acting automatic brake, and a three- or four-jaw chuck, or special fixture, for holding the work. 62

Standard Midget Indicator and Dial Snap Gage

Two new products will be shown for the first time at the Machine Tool and Progress Exhibition in Detroit, March 25 to 29, by the Standard Gage Co., Inc., Poughkeepsie, N.Y. One is a universal midget indicator, shown in Fig. 1, which has a completely geared and fully jeweled transmission without cam or lever action. This indicator has a dial 1 inch in diameter, and is designed to measure to 0.0001 inch, but can be obtained with graduations of 0.001 inch, 0.01 millimeter, or 0.005 millimeter. Over-all dimensions of the indicator are 2 5/8 inches long by 1 1/8 inches wide. Such accessories as a bellcrank lever, universal joint holder, and round and flat faces are available if desired.

The other new product is a dial snap gage, illustrated in Fig. 2, which is designed to measure to 0.0001 inch. In its application to

To obtain additional information on equipment described on this page, see lower part of page 160.

turning and cylindrical grinding, this gage enables the operator to determine when the diameter of the work is approaching the plus limit, so that the feed can be controlled accordingly. The internal mechanism is shock-proof, providing complete protection against severe impacts. The gaging faces are tipped with tungsten carbide and beveled on the front edges. The zero setting is effected by gage-blocks or cylindrical masters, and locking is accomplished by the AGD standard lock for snap gages.

Each gage has a 9/16-inch range, and there are eight sizes covering all dimensions up to 4 1/16 inches. The ranges overlap 1/16 inch. ...63

Fig. 1. Universal Midget Indicator Made by Standard Gage Co.

Fig. 2. Dial Snap Gage Made by Standard Gage Co.

Eclipse Projectile Painting Equipment

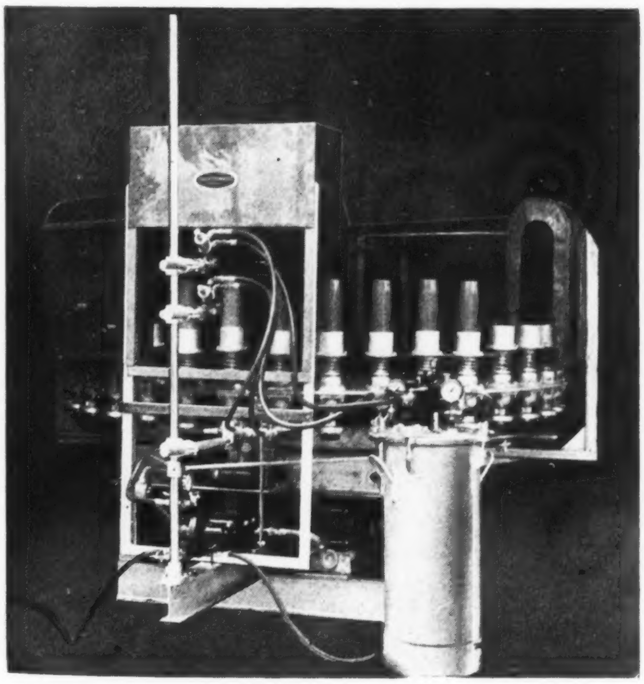
The painting of projectiles ranging in size from 37 to 155 millimeters can be handled automatically on a special machine developed by the Eclipse Air Brush Co., Inc., 400 Park Ave., Newark, N. J. The machine illustrated consists of a 7-foot indexing turntable with thirty-six rotating spindles which carry the shells in front of automatic spray guns that are synchronized to operate with the turntable.

After being sprayed, the projectiles are carried through a steam-jacketed, tunnel type drying oven mounted on the table opposite the spray guns. The shells are placed on the table and removed manually. The rate of operation is 500 shells an hour when six-minute pyroxylin lacquer is applied by the spray guns. 64

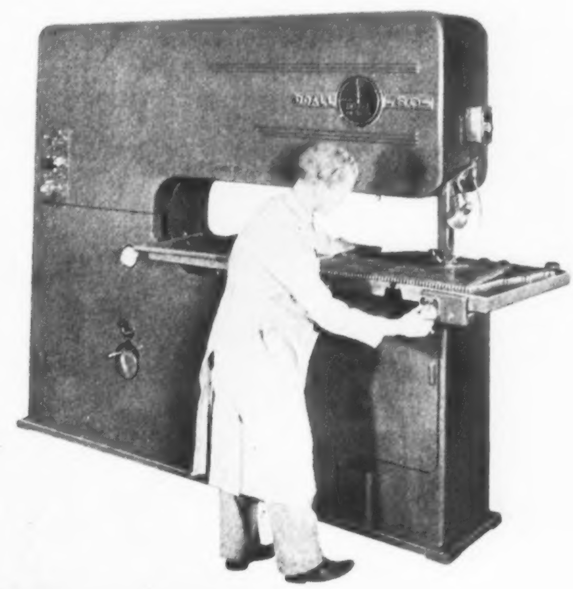
Doall Contour Machine with Deep Throat

A new Doall contour machine with a 5-foot throat has been brought out by Continental Machines, Inc., 1312 S. Washington Ave., Minneapolis, Minn. This machine—the V-60—is designed for continuous sawing, filing, and polishing operations, and has the capacity required for handling unusually large jobs. It will cut work up to 10 feet in diameter by 12 inches thick, and is especially adapted for use in shipbuilding yards, tank and aircraft plants, and other plants where it is necessary to machine large templets or irregular shapes. Narrow-band Doall precision saw blades in sizes from 1/16 to 1 inch in width are used.

A super butt welder which will join the ends of saw blades 1 inch wide as readily as the extremely narrow blades is supplied as regular equipment. The welding or joining



Machine Developed by Eclipse Air Brush Co., for Painting Projectiles



Doall V-60 Contour Machine with 5-foot Throat for Handling Unusually Large Work

To obtain additional information on equipment described on this page, see lower part of page 160.

of the blade ends is accomplished instantaneously. The machine has two large, 30-inch square work-tables. The continuous cutting band passes over three wheels. In handling small work, only the two main driving wheels are used, while the third wheel simply becomes an idler, and the second table need not be utilized. Also, when smaller work is being handled, a hand screw feed which can be locked for quick adjustment is used in place of the automatic power feed.

The illuminated magnifying attachment supplied on other Doall machines is provided on this machine also, for use in sawing to intricate lay-out lines. The "Speedmaster" variable drive provides any speed from 50 to 1500 feet per minute to suit the requirements of the work. The Doall job selector mounted on the machine indicates the cutting speeds and the kinds of saws or files recommended for use on a wide range of materials. 65

Automatic "Micr-O-Size" Control Unit

The Micromatic Hone Corporation, 1345 E. Milwaukee Ave., Detroit, Mich., has brought out an automatic "Micr-O-Size" control unit designed to generate accurately sized bores in the final finishing process at a high production rate. With this equipment, it is claimed that the bores can be finished uniformly within limits of from 0.0002 to 0.0005 inch, thus reducing the tolerance range and number of selective fits.

As shown in the accompanying illustration, the mechanism is arranged with visual dials to facilitate set-up and adjustments, and to give complete operating control. Additional controls provide for instantaneous abrasive expansion only to the average rough bore size by hydraulic pressure control, followed by positive restraint against backlash; a controlled uniform rate of abrasive expansion feed-out to uniform size and finish, under a variable-pressure hydraulically actuated control, synchronized with an adjustable time cycle; and collapse of the abrasive members to the same starting diameter—under mechanical control—and automatic compensation for average stone wear.

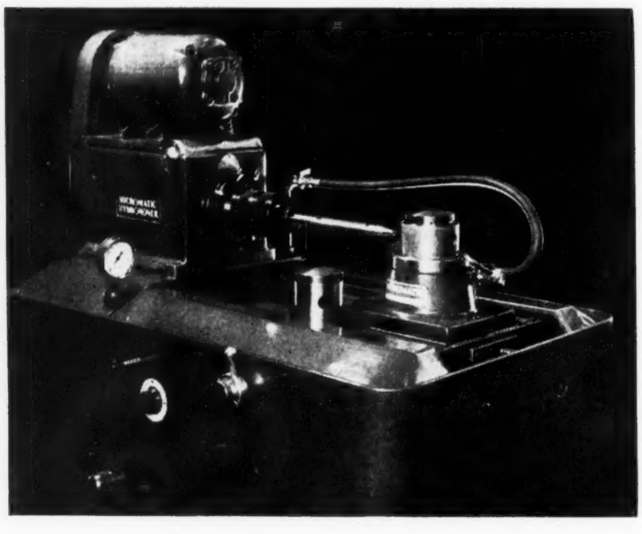
Present applications include the finishing of piston-pin holes after precision boring in a honing cycle of fifteen seconds. From 0.0005 to 0.001 inch of stock is removed from the piston-pin holes, which are 0.750 inch in diameter by 13/16 inch long. Accuracy for roundness and straightness is obtained within limits of 0.0002 inch. A final surface finish of from 3 to 5 micro-inches r.m.s. (root mean square) is obtained. 66

Manheim "Octopus" Flat Transmission Belting

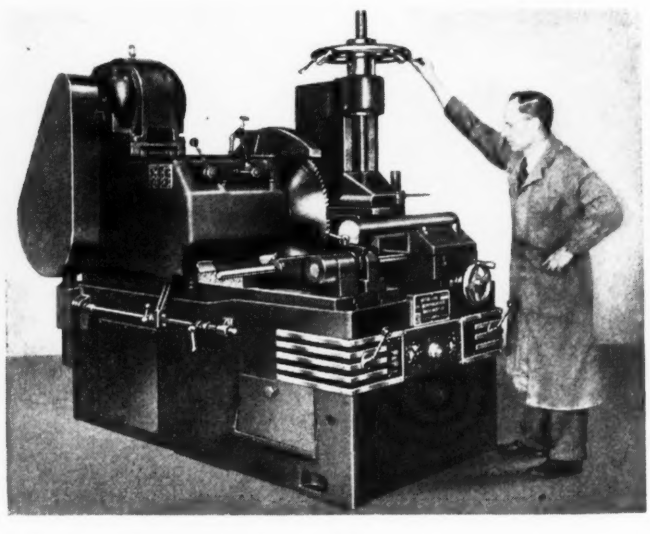
A flat transmission belting that features a powerful pulley grip combined with a high degree of resilience, has recently been placed on the market under the trade name "Octopus" by the Manheim Mfg. & Belting Co., Manheim, Pa. A new method of combining 34-ounce duck with a special impregnating compound provides an unusual grip and resilience so that the belting may be run at low tension to protect bearings and insure long service. This belting has been developed after eight years of research in conjunction with field tests under all kinds of factory operating conditions. It is available in 2- to 12-ply thicknesses and in widths ranging from 1 to 60 inches. 67

Hydraulic-Feed Cold-Sawing Machine

A No. 3 high-speed cold-sawing machine designed to meet the demand for increased production combined with a high degree of accuracy has been developed by the Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland, Ohio. The saw carriage is built as a self-contained unit and encloses the entire saw-blade drive. A multiple-disk clutch and brake running in oil control the starting and stopping of the saw rotation, through the operation of a control lever at the front of the machine. Nine changes of speed ranging from 18 to 134 feet per minute are provided for the saw blade by change-gears, sliding on hardened and ground multiple-spline shafts mounted on Timken bearings. Helical gears with wide faces are used in the final drive train. A "stepless" feed and quick return of the saw carriage are obtained through a low-pressure hydraulic system. Two adjustable valves limit the total feed pressure of the saw carriage and insure clamping of the work prior to the feeding operation. A 2-H.P., 1200-R.P.M. motor operates the hydraulic pump, and a 10-H.P., 1800-R.P.M. motor the saw drive.



"Micr-O-Size" Control Unit Brought out by Micromatic Hone Corporation for Finishing Bores to Close Limits



High-speed Cold-sawing Machine Manufactured by Motch & Merryweather Machinery Co.

To obtain additional information on equipment described on this page, see lower part of page 160.

The machine controls are centralized on a front panel and here, in addition to other controls, is located a "stop-and-go" push-button which controls all of the electrical equipment, as well as an ammeter that measures the power consumed and indicates when the saw blade needs to be resharpened.

The regular equipment includes a 28-inch saw blade capable of cutting 9 5/8-inch round stock, 8 5/8-inch square stock or an 18- by 6-inch vertical I-beam at 90 degrees. A 30-inch blade is available, giving an additional 1-inch range. The machine occupies a floor space of 93 by 57 inches, and weighs 8500 pounds complete with motors. 68

Sheffield Gages and Checking Instruments

New visual type gages, like the one shown in Fig. 1, are being exhibited by the Sheffield Gage Corporation, Dayton, Ohio, at the A.S.T.E. exhibition held this month in Detroit. Gages of this type are used for toolroom checking, checking production gages, process inspection, laboratory and research work, production inspection, and for checking purchased parts. They are built in five magnifications of 10,000, 5000, 2000, 1000, and 500 to 1, all of which employ the frictionless reed mechanism and light-beam lever arm, which is mechanically positive in action.

The Sheffield thread lead checking instrument, shown in Fig. 2, which is also being exhibited, is designed for the rapid and accurate checking of screw leads or the spacing of rack teeth, using precision gage-blocks for direct reference. This instrument is built in bench and portable types. It utilizes the visual gage head, which includes the frictionless and positive reed mechanism, with any desired magnification. The Sheffield "Precisionaire" air gages for checking gun bores will also be shown. 69

Fig. 1. Sheffield Visual Type Gage for Precision Checking

Goodrich Open-End V-Belting

The B. F. Goodrich Co., Akron, Ohio, has brought out a line of open-end V-belting for use on drives where endless V-belts cannot be employed or where they could be applied to the sheaves only at considerable expense and loss of time in dismounting and reassembling a machine.

This belting is made in lengths up to 50 feet; in top widths of 21/32, 7/8, and 1 1/4 inches; and in thicknesses of 7/16, 5/8, and 3/4 inch. The V-angle in each case is 40 degrees. Metal fasteners are used to join the belt ends. 70

"Landmaco HO" Shell Tapper

Recently added to the line of thread-cutting machinery manufactured by the Landis Machine Co., Inc., Waynesboro, Pa., is the "Landmaco HO" shell tapper developed for tapping shells that are too small to be handled efficiently by the larger No. 1 1/2 R Landmaco shell tapper described in November MACHINERY. The basic design is the same as that of the Landmaco threading machine, but a collapsible tap is used in place of the usual die-head, and a special work-holding devise is employed.

The precision-ground collapsible tap is designed primarily for cutting straight threads, and is provided with means for directing the flow of cutting coolant within the bore of the work. The special work-holding device is mounted directly on the carriage, and comprises a hardened and ground bushing to support the nose end of the shell, and either a male or female rear centering bushing. The rear centering bushing is mounted on a slide in direct contact with a lever-operated cam employed to advance the bushing and provide a

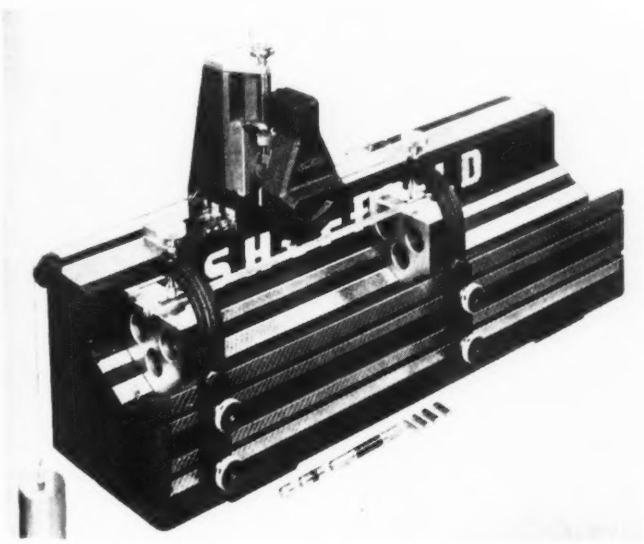


Fig. 2. Thread Lead Checking Instrument Made by Sheffield Gage Corporation

"Landmaco HO" Shell Tapper Manufactured by the Landis Machine Co., Inc.

To obtain additional information on equipment described on this page, see lower part of page 160.

means for locking the work in the fixture.

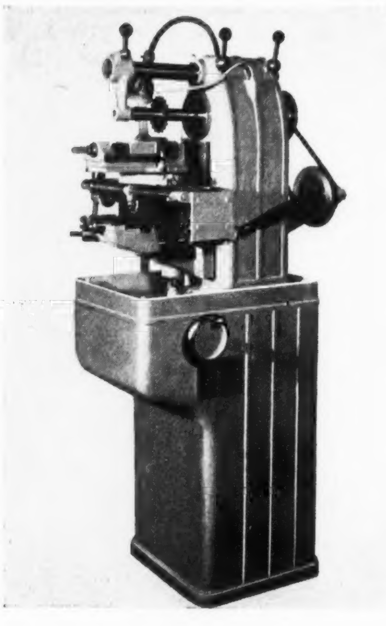
This unit is adjustable for work of different lengths within the range of 60- to 81-millimeter mortar shells of the high-explosive type, and is also suitable for the 3-inch British mortar type shell. The machine is built primarily in a two-spindle model, permitting two die-heads to be operated by one man and thus doubling the production. 71

Jackson Horizontal Milling Machine

A small horizontal milling machine that is adaptable for operations on a wide range of small and medium size parts has recently been placed on the market by the Jackson Machine & Tool Co., Jackson, Mich. The drive to the spindle from the motor enclosed in the base is through a variable-speed unit. Turning the handwheel on the right-hand side of the machine base adjusts the position of the driving V-belt to give the spindle the desired speed.

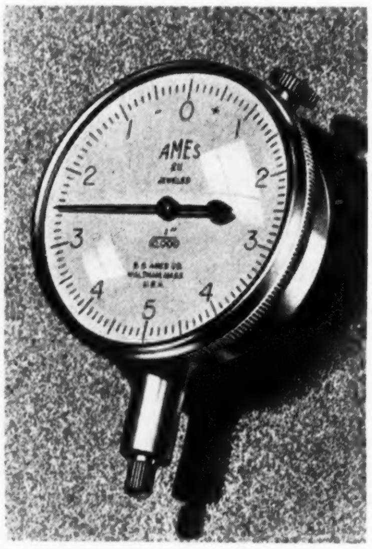
A three-step V-belt pulley at the rear of the spindle drives a second three-step pulley which is connected to a universal-joint shaft and worm that drives the table feed-screw. With this arrangement, any desired speed within the range of the machine is readily obtained. By changing the feed belt, the rates of feed can be adjusted over a wide range.

An automatic device provides for throwing the worm out of engagement with the worm-wheel on the feed-screw at the point required for any individual job. Hand-driving is accomplished by means of a handle. Horizontal and vertical positioning of the table and knee are obtained through the use of a handle that can be applied to the squared ends of the shafts that control these movements.



Horizontal Milling Machine Placed on the Market by the Jackson Machine & Tool Co.

The required adjustment of the over-arm and of the outboard support is effected through three binder levers at the top of the machine. When coolant is required, the fluid is delivered through a flexible tube that receives its supply from a pump in the machine base. 72

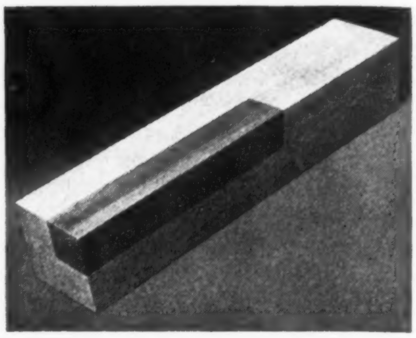


Dial Indicator of New "Hundred Series" Made by B. C. Ames Co.

Ames "Hundred Series" Dial Indicators

A new line of dial indicators designated the "Hundred Series" has recently been placed on the market by the B. C. Ames Co., Waltham, Mass. Among the features of their construction are jewel bearings for all staffs; hardened and ground steel pinions and staffs; involute tooth form in wheels and pinions; rigid supports for staffs; machined-forged-bronze cases and backs; and chromium plating throughout. Carbide-tipped contact points and a patented shock-absorbing unit are optional.

The indicators are available with 1 11/16-, 2 1/4-, 2 3/4-, and 3 5/8-inch diameter dials, and with dial scales indicating tenths of thousandths, half-thousandths, and thousandths of an inch, and thousandths and hundredths of a millimeter. All dimensions and characteristics comply with those adopted by the American Gage Design Committee. 73



Tantung "G" Economy Tool Made by Fansteel Metallurgical Corporation

Fansteel Tantung "G" Economy Tools

A new general-purpose, hard cutting alloy known as Tantung "G" has been developed by the Fansteel Metallurgical Corporation, North Chicago, Ill. This metal, composed of tungsten and tantalum carbide in a matrix of cobalt and chromium, is adapted for machining steel, as well as cast iron, brass, aluminum, and many other materials.

Tantung "G" is obtainable in solid tool bits for use in tool-holders, and also in the form of "Economy" tools. The "Economy" tool bit is securely brazed to a recessed steel shank having approximately twice the cross-section and length dimensions of the Tantung bit. This construction conserves the valuable cutting alloy, and at the same time, provides additional strength and support. The Tantung "G" Economy tools are furnished ground with a 7-degree clearance angle at the end, so that the same tool serves for both right- and left-hand cutting. 74

Bruning Printing Machines

A 42-inch printing machine known as the Model 55BW printer has just been placed on the market by Charles Bruning Co., Inc., 100 Reade St., New York City. This machine is unusually compact for its capacity, measuring only 32 inches wide, 62 inches long, and 48 inches high. It operates with either cut sheets or roll stock, printing ink tracings at the rate of from 12 to 15 feet per minute. A full-view speed indicator is located above the feed board.

The entire top of the machine serves as a return tray, the return being so designed that the tracing enters the tray on top of the print in exactly the same position it enters the machine. No reversing of the tracing is necessary when it is reinserted. The exposed sheets are

To obtain additional information on equipment described on this page, see lower part of page 160.

Printing Machine Placed on the Market by Charles Bruning Co.

stacked on the tray as they come from the printer. The light source is a 55-watt new type mercury vapor quartz lamp. A double centrifugal blower is employed to reduce operating noise, and an automatic clutch, operated by a wide-range foot-pedal, releases the feed roller, so that the tracing can be adjusted or removed when necessary. The printer is available for operation on 220-volt, 60-cycle or 50-cycle alternating current. The operation of the entire machine requires only 3800 watts. 75

Severance Deburring Cutter

A cutting tool for deburring the ends of rods and tubing that was formerly supplied only on special order has now been added to the regular line of Midget cutters manufactured by the Severance Tool Mfg. Co., E. Genesee Ave., Saginaw, Mich. This new cutting tool has a mouth angle that produces a chamfer of either 30 or 45 degrees. Efficient chamfer cutting action is obtained by a tooth design which produces a shearing cut that forces the chips out, or away from the tool, thus preventing loading. The cutters are available in sizes suitable for handling rods from 3/16 inch to 4 inches in diameter. 76

Dayton Rogers Universal Pneumatic Die Cushion

The Dayton Rogers Mfg. Co., Minneapolis, Minn., has just brought out a Model DM universal pneumatic die cushion. The cushion is completely self-contained, requires no surge reservoir, and is furnished with a combination regulator and gage for connection to the shop air-line. It can be adapted to all punch-press deep-drawing operations, and can be used to advantage for the pressure-pad control on many forming dies. All pin pressure pads are fabricated for the individual press application, with the correct amount of press bed clearance in each case.

The correct height of the pin pressure pad is maintained and controlled by the handwheel adjustable feature, making it unnecessary to correct the length of the pressure pins to compensate for variations in bolster-plate thickness and the sharpening and grinding of compound dies or to suit changes in die design.

This type of cushion installation makes it possible to remove the bolster plate at any time without disturbing the cushion. The cushions are now being manufactured in six sizes having deep drawing capacities of 5 inches and less, with ring holding pressure up to 10 tons on a 100-pound air line. Each cushion is complete with the necessary high-pressure flexible hose and fittings for quick installation. 77

Universal Pneumatic Die Cushion Made by Dayton Rogers Mfg. Co.

Drilling and Boring Attachment for Electric Drills

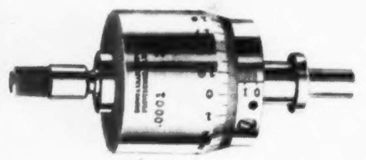
A drilling and boring attachment that can be easily and quickly applied to portable electric drills is being placed on the market by the Kett Appliance Co., Union Central Bldg., Cincinnati, Ohio. As shown in the illustration, the "Kett Universal" attachment consists essentially of a compact drilling head equipped with a drill chuck that can be rotated through a complete cycle, or 360 degrees, and clamped in place for drilling at any angle and in any plane; an extension in the form of a square tubing with a yoke or clamp for attaching to the portable drill; and a driving shaft for the drilling head. The driving shaft is held in the electric drill chuck and passes through the extension.

The Model KU2, heavy-duty, short-range attachment shown is equipped with a 1/2-inch Jacobs chuck, and is designed for use with a 1/2-inch heavy-duty electric drill. The attachment is made in various sizes, with telescopic extensions and with extensions of different lengths. The size illustrated is particularly adapted for large portable shop and maintenance work. It can be attached to an electric drill in three minutes, has a capacity for boring holes up to 2 inches in diameter in wood, and is especially adapted for steam-fitting and plumbing work.

A smaller sized attachment intended for use by electricians will bore holes up to 1 1/4 inches in diameter in wood, and can be fitted with a telescopic extension that permits the operator to bore holes in joists in 10-foot ceilings while standing on the floor. Three Kett universal attachments for 1/4-inch electric drills are being made for automobile assembly and airplane work and for garage and maintenance work. 78

Kett KU2 Heavy-duty, Universal Drilling and Boring Attachment for Electric Drill

To obtain additional information on equipment described on this page, see lower part of page 160.



Micrometer Head Recently Added to B & S Line

New Brown & Sharpe Micrometer Head

The Brown & Sharpe Mfg. Co., Providence, R. I., has recently added another micrometer head to its line of precision tools. This new micrometer head is available in both English and metric measure, and is especially designed for making fine measurements. The measuring screw of the English-measure head is 50 threads per inch, and the thimble has 200 graduations, giving direct readings to 0.0001 inch.

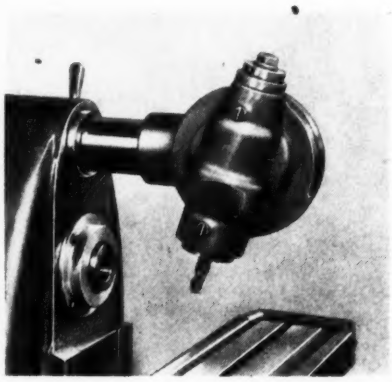
The measuring screw for the metric-measure head is of 1/2 millimeter pitch, and the thimble has 200 graduations reading directly to 0.00025 millimeter. The graduations are clean-cut and easy to read. The shank is approximately 31/64 inch in length, and is threaded back 1/8 inch from the end for a lock-nut. The diameter of the shank is 3/8 inch, and the spindle projects 9/16 inch with the micrometer set at zero. 79

H & G "Spectifier" for Inspecting Screw Machine Parts

A device known as the H & G "Spectifier," designed to provide a convenient, high-speed method of inspecting the finish and other details on screw machine parts and similar work up to about 3 inches in diameter, has been developed by the Eastern Machine Screw Corporation, 23-43 Barclay St., New Haven, Conn.

H & G "Spectifier" for Inspecting Screw Machine Parts

The lens of this device provides almost instant focus on both large and small fields, and flat, as well as curved surfaces. The size of the lens makes it possible to use both eyes for inspecting work from all angles and at varying distances from the lens. The light source provides efficient and uniform illumination, overcoming the objectionable variations usually encountered when inspecting work under different degrees of artificial or natural light. 80



Vertical Head Made by Machinery Mfg. Co. for Vernon No. 0 Horizontal Milling Machine

Vertical Head for Vernon Milling Machine

A new vertical head for use with the Vernon No. 0 horizontal milling machine has been brought out by the Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Calif. This head can be used at any angle and in any plane. The spindle of the attachment has a No. 7 B & S taper, and is driven through compound bevel gears carried in the head, which swivels in a plane parallel to the axis of the shaft. The head can be quickly installed by removing the over-arm of the machine. The tools are held by a draw-in collet. 81

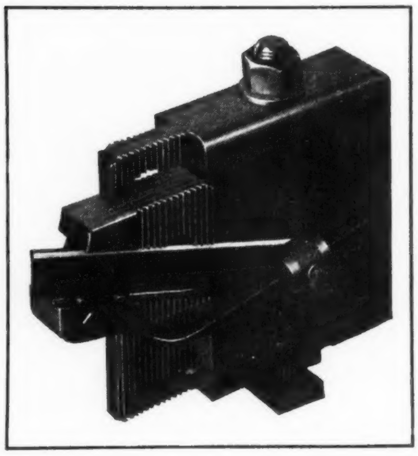
"Artus" Milling-Cutter Spacers

Milling-cutter spacers of synthetic resin are being introduced in the United States under the trade name "Artus" by the Industrial Products Suppliers, 2 Broadway, New York City. These spacers serve to adjust the precise clearances required in gangs of milling cutters, particularly where the individual cutters have been reground. They are also useful in spacing slitting saws or gears.

They are non-hygroscopic and impervious to oil, and retain their thickness and evenness under all normal conditions. They are made in thicknesses of 0.001, 0.0015, 0.002, 0.003, 0.005, and 0.0075 inch, each of which is distinguished by an identifying color which insures quick selection without the aid of a micrometer caliper. They are available with hole diameters from 1/2 inch to 2 inches, and can be obtained with keyways cut to American cutter standards or without keyways. 82

Adjustable Cutting-Off Tool Holder

The Empire Tool Co., 8790 Grinnell Ave., Detroit, Mich., is now manufacturing a new holder for the Luers patented cutting-off blade. The new tool equipment is adapted for use on automatic wire-feed and hand screw machines of capacities up to approximately 7/8 inch. This holder permits the blade to be adjusted for center height with but little of the blade protruding, and provides the rigidity of a forged tool. The holder can be used in either the front or back position, with the spindle running in either the forward or reverse direction. 83



Holder Made by Empire Tool Co. for Luers Cutting-off Blade

Millers Falls Double-Edged Hacksaw Blade

A two-edged hacksaw blade, designated the "Double-Life Blu-Mol," has been developed by the Millers Falls Co., Greenfield, Mass. Dragging of

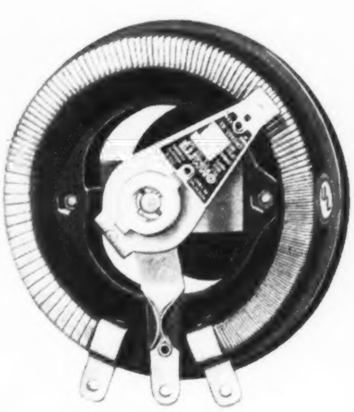
To obtain additional information on equipment described on this page, see lower part of page 160.

Double-edged Hacksaw Blade Made by Millers Falls Co.

the trailing edge in the saw cut is avoided by setting the teeth of the first edge slightly wider than those of the second. Improved heat-treatment, which leaves the teeth hard and the ends and center soft, is claimed to have eliminated breakage and to have made the blades shatterproof. These blades cost only 50 per cent more than the single-edged type, and it is claimed that they will do twice as much work per blade at a cutting speed equal to twice the speed usually employed. 84

Ohmite Rheostats for Generator Field Control

The Ohmite Mfg. Co., 4835 Flournoy St., Chicago, Ill., is now producing a line of generator field con-



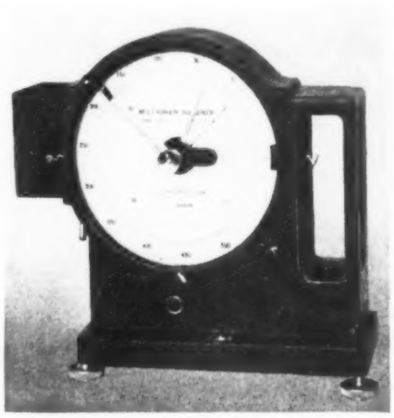
Rheostat for Generator Field Control Made by Ohmite Mfg. Co.

trol rheostats designed to provide smooth, close, and gradual control of generator voltage. This rheostat is of compact, vitreous enameled construction, and provides practically continuous variation of resistance. Its small size adapts it for use on portable equipment, such as welding generators and lighting plant generators, and for use on ships, trains, airplanes, and automotive equipment.

These field rheostats are tapered or uniformly wound, as required, to provide control for separately or self-excited generators. They are available in a series of 10-wattage sizes from 25 to 1000 watts, which range can be increased by connecting the rheostats in tandem. 85

Roller-Smith Precision Balances

The Roller-Smith Co., 1766 W. Market St., Bethlehem, Pa., has placed on the market a line of preci-



Precision Balance Made by the Roller-Smith Co.

sion balances designed for the rapid and accurate determination of the weight of small objects and materials where a number of weighings of approximately the same value must be made. The balances are adapted for weighing lamp filaments and small mechanical parts; small quantities of ground substances, such as gunpowder charges and precious ores and powders; liquids, etc., in the paint, chemical, mining, and textile manufacturing industries. They are made in three models. One model has a guaranteed accuracy of one-fifth of 1 per cent, while a smaller design has an accuracy of one-tenth of 1 per cent. 86

Roller-Arm Type Metal-Clad Micro Switch

A metal-clad micro switch with a roller arm that is adjustable vertically through an arc of 225 degrees around its pivot pin and also has a horizontal adjustment in eight positions 45 degrees apart has just been placed on the market by the Micro Switch Corporation, Freeport, Ill. This switch is suitable for slide or cam actuation. It is rated by Underwriters at 1200 watts up to 600 volts on alternating current, and is made in the single-pole type only, with normally closed or open, or double-throw contact arrangements. 87

Capacity of Universal Machine Head—Correction

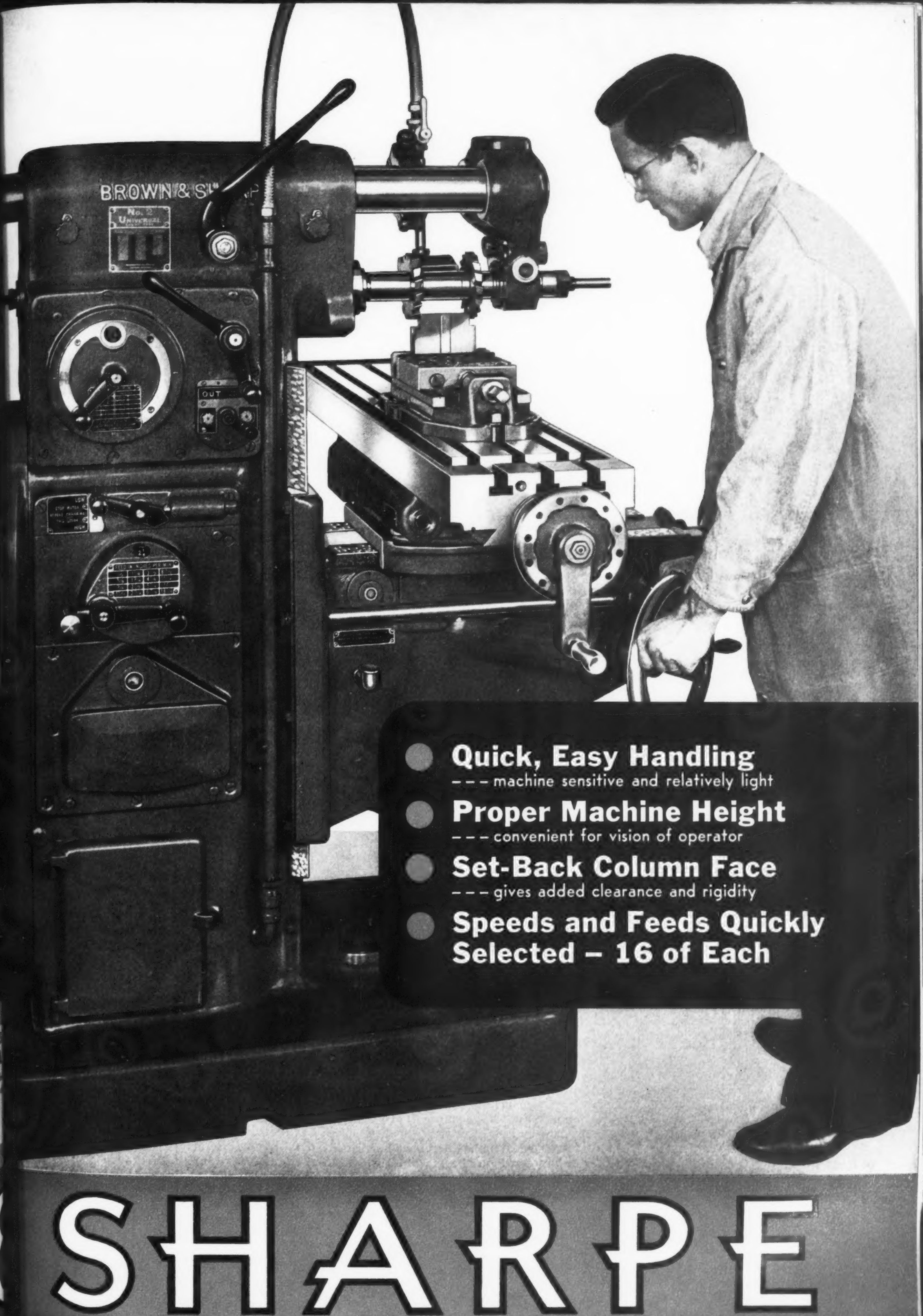
In the description of the universal machine head built by John Kis, 2028 Phillips Ave., Racine, Wis., which appeared on page 167 of February MACHINERY, it was stated that the bar has a 5-inch stroke, giving a capacity for boring holes up to 10 inches in diameter. This statement gives the erroneous impression that 10 inches is the largest diameter which can be bored, whereas one of the principal advantages of the machine head is its ability in all operations — counterboring, facing, etc.—to bore holes over 10 inches in diameter on large, heavy work. The 5-inch stroke referred to merely gives an adjustment equivalent to 10 inches on the diameter, tool-bars of any length required being used for larger diameters.

* * *

For suggesting better ways to do work, 11,510 employes of the General Electric Co. were paid awards of $77,477 during 1940. The highest single award was $500, made to an employe of the Schenectady Works. The average award per adopted suggestion was $6.73. Suggestions were offered by 33,409 employes, an increase of 23 per cent over 1939. Of these suggestions, about one-third were accepted.

Micro Switch with Adjustable Roller Arm

To obtain additional information on equipment described on this page, see lower part of page 160.


Quick, Easy Handling
--- machine sensitive and relatively light
Proper Machine Height
--- convenient for vision of operator
Set-Back Column Face
--- gives added clearance and rigidity
Speeds and Feeds Quickly Selected – 16 of Each
SHARPE

NEWS OF THE INDUSTRY

Canada

DR. PAUL DYER MERICA, vice-president of the International Nickel Co. of Canada, Ltd., inaugurated the annual George Kimball Burgess Memorial Award Lectures at a recent banquet given by the Washington Chapter of the American Society for Metals. This honor, recently established as an annual feature by the chapter, is limited to persons who have distinguished themselves in the field of metallurgy. Dr. Merica's subject was "Progress in Alloy Metallurgy." H. J. FRENCH, metallurgist with the International Nickel Co., Inc., 67 Wall St., New York City, recently addressed the Boston Chapter of the American Society for Metals on the subject "Recent Progress in Alloy Constructional Steels."

A. C. WICKMAN (CANADA), LTD., 704 C.P.R. Bldg., Toronto, Canada, has recently been formed as a subsidiary of A. C. Wickman, Ltd., Coventry, England. The new company has purchased 25 acres of ground at Etobicoke, Toronto, Canada, on which a factory is being erected for the production of cemented-carbide tips and tools. W. T. MUIRHEAD, formerly area manager for the concern covering Scotland and the northeast coast of England, has been made vice-president and general manager of the Canadian company.

KENNAMETAL TOOLS & MFG. CO., LTD., 24 Dunbar St., Hamilton, Ont., Canada, has recently obtained a franchise for the distribution of Kennametal tips and finished tools. A machine shop has recently been completed for the machining of tool shanks, the brazing on of tips, and the grinding of these tools.

California and Washington

D & M MACHINE WORKS, Torrance, Calif., have acquired from the ROCKFORD MACHINE TOOL CO., Rockford, Ill., the rights to manufacture and distribute the "Economy" lathes that have up to the present time been built by the Rockford Machine Tool Co. Production has already been started by the D & M Machine Works on this line of lathes.

CARL W. COSLOW, formerly mechanical superintendent of the Hamilton Watch Co., Lancaster, Pa., has joined the executive staff of the Lockheed Aircraft Corporation, Burbank, Calif.

FAIRMAN B. LEE, 166 Jackson St., Seattle, Wash., has been appointed representative for the Ajax Electric Co., Inc., Philadelphia, Pa.

Illinois and Indiana

BUICK DIVISION OF THE GENERAL MOTORS CORPORATION is constructing a $31,000,000 aircraft engine plant in the village of Melrose Park, Chicago, Ill. The new plant will be built under Government contract for the production of Pratt & Whitney 1200-H.P. aircraft engines. It will employ in the neighborhood of 10,000 people, with an estimated annual payroll of $17,000,000. The site occupies 125 acres. The building will be a huge one-story manufacturing plant with more than 1,000,000 square feet of floor space. In addition, there will be twenty-four test cells for testing the engines, a power house, and administration buildings.

DEVILBISS CO., manufacturer of spray painting equipment, exhaust systems, air compressors, and hose, has recently opened a new sales and service branch at 1280 W. Washington Blvd., Chicago, Ill. The new building contains a display room and a department in which spray coating machines are installed ready for operation.

WALTER E. MARBLE, sales representative of the D. A. Stuart Oil Co., Chicago, Ill., recently celebrated the completion of fifty years in the service of the company. At a gathering in his honor, the sales division paid tribute to his work in a group letter.

GEORGE A. MURPHY, JR., has joined the Industrial Sales Division of the American Steel Foundries, 410 N. Michigan Ave., Chicago, Ill. He will make his headquarters at the East Chicago, Ind., plant of the company.

Michigan and Wisconsin

HAMMOND MACHINERY BUILDERS, INC., Kalamazoo, Mich., has recently made an addition to its plant that will provide more than twice the amount of space formerly available for manufacturing. A new recreation room with showers, wash fountains, and lockers, card tables and other recreation facilities is included. Part of the addition will house a modern engineering office and demonstration room, where Hammond grinding and polishing machines will be kept on display. The factory will also contain a new processing room where samples submitted by prospective customers will be processed on the machine in which the customer is interested.

WESSON CO., 1050 Mount Elliott, Detroit, Mich., manufacturer of cemented-carbide and high-speed steel cutting tools, has recently broken ground for a new plant on Woodward Heights Blvd. at Ferndale, a suburb of Detroit. The new plant and equipment will more than double the capacity of the company's present plant. It is expected that the new quarters will be ready for occupancy about March 15. The Campbell Construction Co. is the contractor for the job.

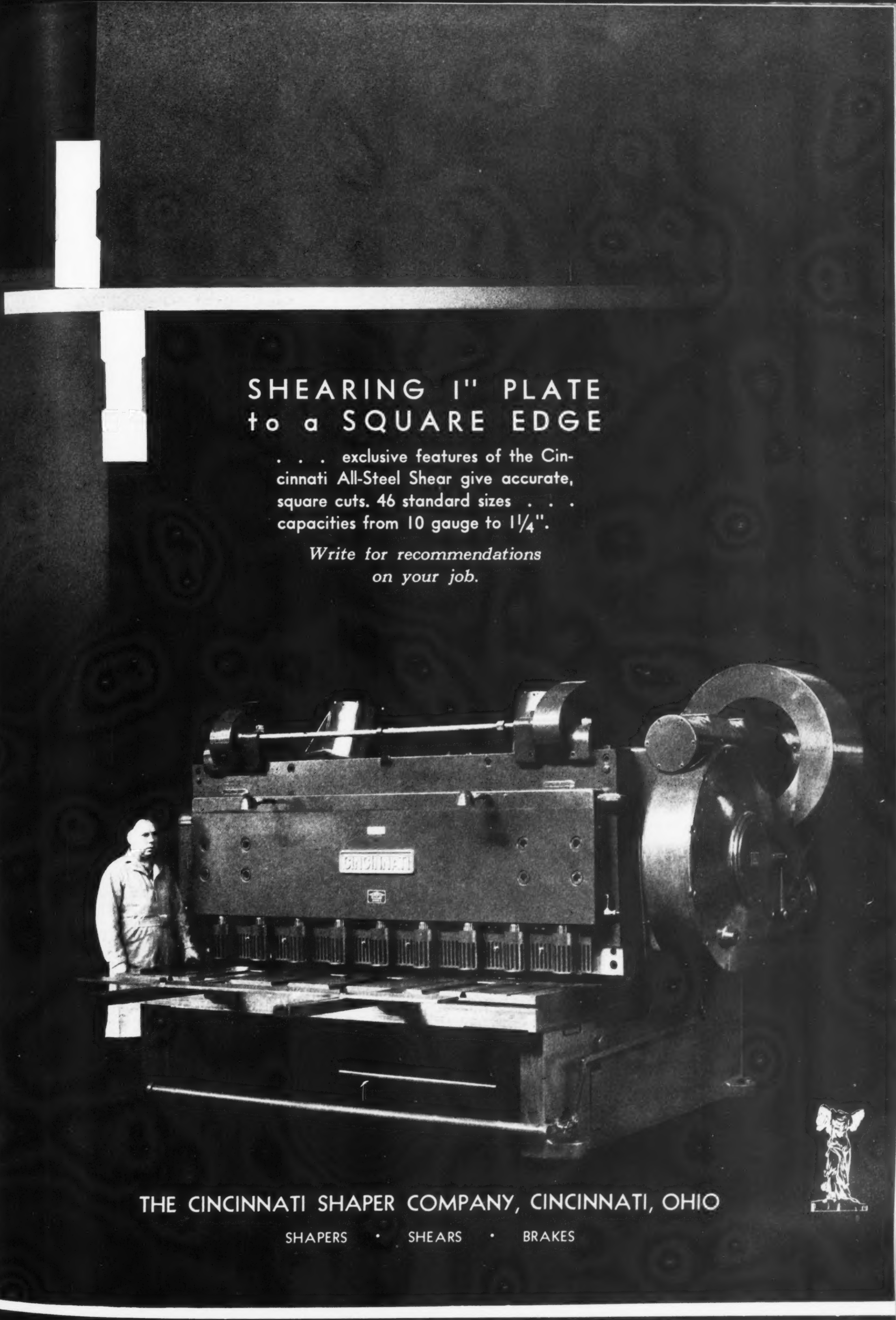
R. H. HATHAWAY, formerly sales engineer for the Production Machinery Co., Greenfield, Mass., has been appointed assistant to the chief engineer, HENRY J. KINGSBURY, of Hammond Machinery Builders, Inc., Kalamazoo, Mich.

R. H. Hathaway, Assistant to Chief Engineer of Hammond Machinery Builders, Inc.

A. G. NANCARROW was elected president of the Universal Engineering Co., Frankenmuth, Mich., manufacturer of drill bushings and collet chucks, at a recent meeting of the board of directors. Mr. Nancarrow has been representative of the company in the Detroit district for the last eight years.

HOVIS SCREWLOCK CO. announces that it has recently moved into new quarters at 8100 Nine Mile Road E., Van Dyke (Detroit), Mich.

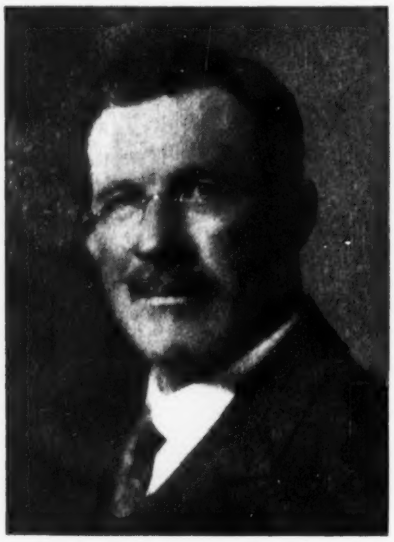
M. W. ROGERS, formerly general factory manager of the Caterpillar Tractor Co., Peoria, Ill., was recently elected president of the Davis & Thompson Co., of Milwaukee, Wis. The latter company has been engaged for many years in the building of production machinery for the automotive and other industries. WILLIAM WEIMER, long connected with the Davis & Thompson Co., remains with the company as vice-president. Mr. Rogers has also been elected president


SHEARING 1" PLATE to a SQUARE EDGE
. . . exclusive features of the Cincinnati All-Steel Shear give accurate, square cuts. 46 standard sizes . . . capacities from 10 gauge to 1¼".
Write for recommendations on your job.
CINCINNATI
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO
SHAPERS · SHEARS · BRAKES

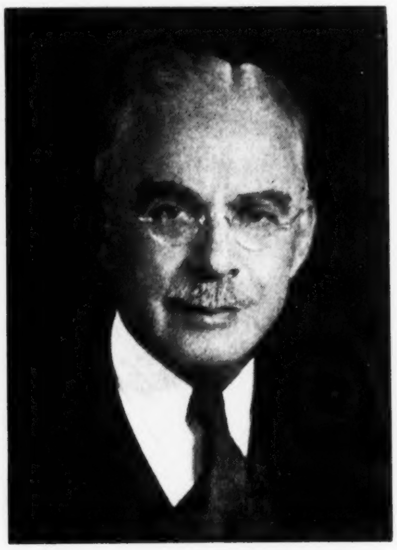
of the Potts Machine Co., Jackson, Mich., manufacturer of tools, dies, and special machinery, and president of the Universal Power Shovel Corporation, of Milwaukee, Wis.

New England

GEORGE N. JEPPSON, vice-president and treasurer of the Norton Co., Worcester, Mass., has been elected president, succeeding ALDUS C. HIGGINS, who has resigned to become chairman of the board, filling the position left vacant by the death of Charles L. Allen. Mr. Jeppson entered the employ of the Norton Co. in 1892. After having served as assistant superintendent and works manager, he was chosen a director in 1906. In 1919 he was made secretary, and in 1933 became treasurer. He has been a vice-president for several years.



Aldus C. Higgins, Recently Elected Chairman of the Board of the Norton Co.



George N. Jeppson, Who Succeeds Mr. Higgins as President of the Norton Co.

Charles A. Simmons, Sr., Appointed a Member of National Defense Advisory Commission

Mr. Higgins became identified with the company in 1900. He was first manager of the abrasive plants, and in 1912 was elected secretary. In 1919 he became treasurer and general counsel. He has been president since 1933. HENRY DUCKWORTH, retiring assistant treasurer, was elected vice-president. MILTON P. HIGGINS, previously assistant manager of research and abrasive plants, was elected treasurer, and WILLIAM J. MAGEE, previously controller, was elected assistant treasurer.

DONALD S. MCKENZIE has been appointed sales manager of the plastics department of the General Electric Co., at Pittsfield, Mass., succeeding W. H. MILTON, JR., who was recently made assistant manager of the department.

BULLARD CO., Bridgeport, Conn., announces another important plant expansion in support of the Defense Program, consisting of the construction of a large machine tool assembly building. More than two acres of additional production space will be provided in the new structure, which will be one story in height and will measure 180 by 500 feet. The contract for the new building has been awarded to the Turner Construction Co., of New York City. This is the fifth expansion undertaken by the company since June of last year.

C. ARTHUR HOAGLUND was recently elected director and secretary of the Gammons-Holman Co., Manchester, Conn. He became connected with the company in 1927 as assistant to William B. Gammons, inventor and founder of the company, and for the last seven years has been production manager of the plant. Other officers of the company are MARION G. FITCH, president and treasurer, and SHERWOOD G. BOWERS, vice-president.

New York and New Jersey

OTTO W. WINTER, Tonawanda, N. Y., well known in tool engineering circles, has been appointed chairman of the Emergency Defense Training Committee of the American Society of Tool Engineers. This committee functions with the National Education Committee established a few months ago to determine the needs of industry for skilled men and to develop the necessary plans for their education.

GEORGE SCHERR CO., INC., 128 Lafayette St., New York City, has been appointed exclusive distributor, for both domestic and foreign sales, for the Wilder Micro-Projector manufactured by R. S. WILDER, INC., of Waltham, Mass. The Micro-Projector is a highly accurate machine for measuring or comparing objects by means of a magnified shadow image, and is especially applicable to gears, screw threads, irregular-shaped pieces, gages, and similar equipment.

CHARLES A. SIMMONS, SR., president of the Simmons Machine Tool Corporation, Albany, N. Y., has been appointed a member of the National Defense Advisory Commission. He will be attached to the machine tools and heavy ordnance section of the commission. Mr. Simmons will pass five days every week in Washington.

DEALTON J. RIDINGS has been advanced to the position of general manager of the Porter-Cable Machine Co., Syracuse, N. Y., and HARVEY L. RAMSEY has been promoted to the post of general sales manager.

R. S. STOKVIS & SONS, INC., 17 Battery Place, New York City, announces that the home office of the company has been transferred from Rotterdam, Holland, to Willemstad, Curacao, Dutch West Indies.

AMTHOR TESTING INSTRUMENT CO., INC., has recently purchased a two-story factory building at 45-53 Van Sinderen Ave., Brooklyn, N. Y., and is now occupying its new quarters.

DE LISSER MACHINE & TOOL CORPORATION is now located at 401 Broadway, New York City.

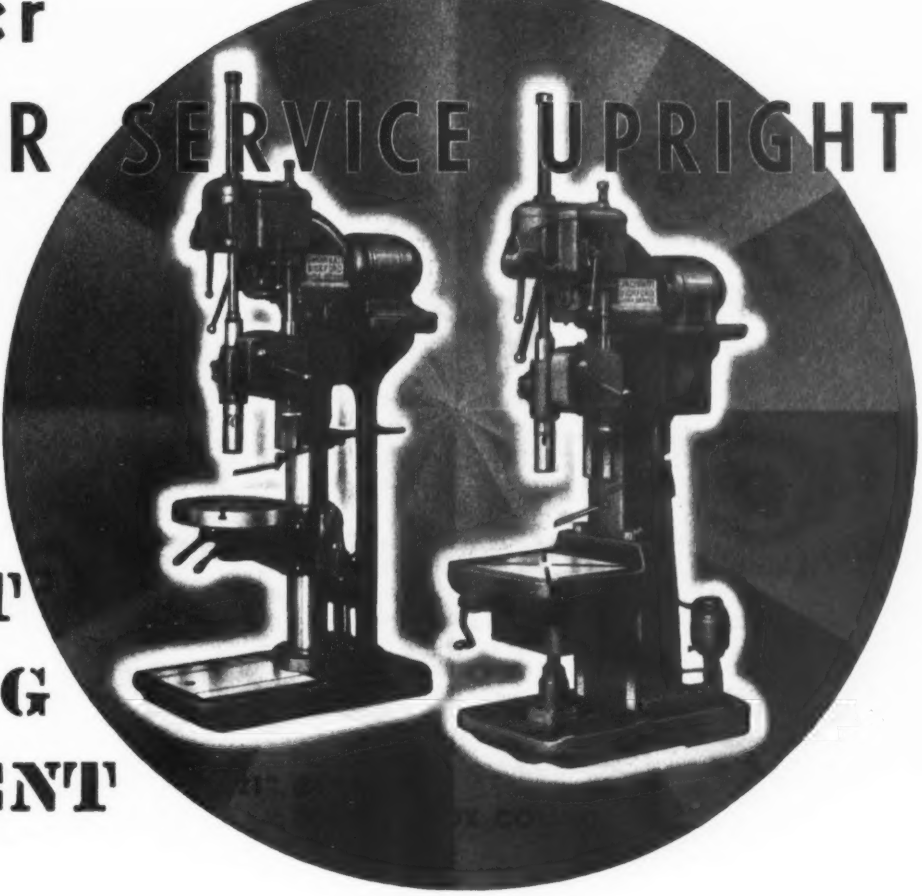
H. O. BATES, 251 N. Broad St., Elizabeth, N. J., manufacturer of marking devices, has been incorporated under the name THE ACROMARK CORPORATION. The officers of the corporation are as follows:

PRODUCTION EFFICIENCY

wherever THE SUPER SERVICE UPRIGHT

Dominates

THE UPRIGHT DRILLING DEPARTMENT



Because of the following outstanding features, these machines are truly SUPER SERVICE uprights:

1. Spindle and Feed changes all controlled by a single lever.
2. Direct reading speed and feed plates.
3. Spindle and Feed changes obtained through sliding gears.
4. Multiple splined integral key construction.
5. Heat treated alloy steel gears with ground teeth.
6. Non-friction, ball and roller type bearing construction.
7. Automatic lubrication throughout.
8. Positive type clutch for feed engagement, eliminating drop worm construction or disengaging gears.
9. Automatic adjustable feed trip and safety trips at top and bottom of spindle travel.
10. Direct connected driving motor with convenient, close coupled mounting.

If you are interested in catalogues pertaining to any of the SUPER SERVICE line of metal drilling machines, do not hesitate to write us.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY, CINCINNATI, OHIO, UNITED STATES OF AMERICA

president, H. O. Bates; vice-president, J. L. Golomb; treasurer, A. D. Bates; and secretary, S. R. Rosenberg.

Ohio

Paul W. Arnold has been made manager of machinery design applications for the Reliance Electric & Engineering Co., Cleveland, Ohio. Mr. Arnold has

Paul W. Arnold, Manager of Machinery Design Applications, Reliance Electric & Eng. Co.

been engaged in application engineering work for the company since 1927, when he graduated as a mechanical engineer from the University of Michigan.

Monarch Machine Tool Co., Sidney, Ohio, is making the third addition in eighteen months to the company's plant, which will expand the production facilities for manufacturing lathes for the defense program 40 per cent. Employment in the plant will be increased from 1000 to approximately 1400 men. It is expected that the new building will be completed and most of the equipment installed in eight weeks.

Hill Acme Co., 6400 Breakwater Ave., N. W., Cleveland, Ohio, has appointed the following representatives for its line of heavy-duty hydraulic precision surface grinders: Swind Machinery Co., Philadelphia, Pa.; Wilson-Brown Co., New York City; Arch Machinery Co., Pittsburgh, Pa.; and William K. Stamets, Cleveland, Ohio.

William L. Dolle was recently elected president and general manager of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, at a meeting of the board of directors. Fred Albrecht was elected vice-president and treasurer; Louis L. Weber, secretary; and Fred Schoeffler, works manager.

Pennsylvania and West Virginia

Arthur C. Allshul, manager of the Philadelphia plant of Joseph T. Ryerson & Son, Inc., retired on February 1 after forty-two years of continuous service with the company. He has the distinction of having the longest continuous service record of anyone now in the Ryerson organization. Mr. Allshul began working as a very young man at the Chicago plant in 1899. After serving in the sales department in that plant, he became district sales manager at Milwaukee, Wis. In 1919, upon the acquisition of the Ferguson Steel and Iron Corporation of Buffalo, Mr. Allshul took charge as manager of that plant. He remained at Buffalo until 1929, when he was appointed manager of the Philadelphia plant.

Jessop Steel Co., Washington, Pa., announces the establishment of a new branch office and warehouse at Woodbridge and Walker Sts., Detroit, Mich. A new warehouse was also recently established at 1433 Hamilton Ave., Cleveland, Ohio, and the Cleveland branch office has been moved to that address. Complete stocks of Jessop steels in sheet, bar, and plate form are carried at both warehouses. David Hanna is in charge of the Detroit branch, and F. P. McGahan of the Cleveland branch.

Whiting Corporation, Harvey, Ill., has opened a district sales office at Philadelphia, Pa., in the Broad St. Station Building, Room 838. L. D. Reed will be in charge of the new office. He has served the company for twenty-six years, both in the capacity of engineer and salesman.

James M. Mead has been appointed manager of the Philadelphia plant of Joseph T. Ryerson & Son, Inc., succeeding Arthur C. Allshul. Mr. Mead was

James M. Mead, Manager of the Philadelphia Plant of Joseph T. Ryerson & Son

formerly assistant manager of this plant, and has been connected with the company for twenty-two years.

J. Heber Parker, for the last twenty-five years vice-president of the Carpenter Steel Co., Reading, Pa., has been elected president of the company, succeeding the late Fred A. Bigelow. Mr. Parker began his career in the chemical laboratory of the Carpenter Steel Co. during his college vacations. After graduating from

J. Heber Parker, Newly Elected President of the Carpenter Steel Co.

Cornell University, he entered the crucible department of the company. In 1906, he was made assistant superintendent, in 1910 chief metallurgist, and in 1916 was elected vice-president.

Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., manufacturer of alloy steels for machine tools, aircraft engine valves, and other equipment essential to defense needs, is increasing its capacity for melting special steels by the installation of two additional electric melting furnaces at the Brackenridge, Pa., plant of the company, which will increase the output approximately 4000 tons per month.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., announces the election of four executives to the rank of vice-president, as follows: Bonnell W. Clark, president of the Westinghouse Electric Supply Co.; R. A. McCarty, manager of Steam Division; Frank D. Newbury, manager of Emergency Products Division; and A. C. Streamer, general manager of East Pittsburgh Division.

Conrad O. Hersam, consulting and designing tool engineer, announces the removal of his offices from 4954 Germantown Ave., Philadelphia, Pa., to new and larger quarters at 6 W. Queen Lane.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J. A. MAYWHORT was re-elected president of the Bilgram Gear & Machine Works, Inc., 1217 Spring Garden St., Philadelphia, Pa., at the recent annual meeting of the board of directors.

WILLIAM G. THEISINGER, who since 1935 has been welding and metallurgical engineer of Lukens Steel Co., Coatesville, Pa., has been appointed director of welding research of the concern.

WESTINGHOUSE ELECTRIC & MFG. Co. is starting to build at Fairmont, W. Va., what is expected to be the world's largest plant devoted exclusively to the manufacture of fluorescent lamps. The new plant will be a one-story building, 830 by 220 feet, and will cost $3,000,000.

* * *

Gear Production Remains at High Level

The American Gear Manufacturers Association, 602 Shields Bldg., Wilkinsburg, Pa., reports that industrial gear sales for January, 1941, were 110.5 per cent above January, 1940, and 24.5 per cent above December, 1940. For comparative purposes, the Association has taken the production in 1928 as having an index number of 100. The index number for January, 1941, is 259. It should be noted that this applies only to industrial gears; the figures referred to do not include automotive gears or gears used in high-speed turbine drives.

COMING EVENTS

MARCH 12-13—Meeting on NATIONAL DEFENSE held under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Statler, Cleveland, Ohio. C. E. Davies, secretary, 29 W. 39th St., New York City.

MARCH 13-14—Conference on INDUSTRIAL GAS USES at the Lord Baltimore Hotel, Baltimore, Md. For further information, address Harry W. Smith, Jr., American Gas Association, 420 Lexington Ave., New York City.

MARCH 25-29—MACHINE AND TOOL PROGRESS EXHIBITION, under the sponsorship of the American Society of Tool Engineers, to be held in Convention Hall, Detroit, Mich. For further information, address Ford R. Lamb, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

APRIL 1-3—Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Atlanta, Ga. C. E. Davies, secretary, 29 W. 39th St., New York.

APRIL 22-25—Twelfth annual SAFETY CONVENTION AND EXHIBIT in New York City. For further information, address Greater New York Safety Council, Inc., 60 E. 42nd St., New York City.

MAY 5-7—Twenty-fifth annual convention of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Homestead, Hot Springs, Va. J. C. McQuiston, secretary, 602 Shields Bldg., Wilkinsburg, Pa.

MAY 12-15—Annual convention of the AMERICAN FOUNDRYMEN'S ASSOCIATION at the Hotel Pennsylvania, New York City. C. E. Hoyt, executive secretary, 222 W. Adams St., Chicago, Ill.

MAY 19-23—WESTERN METAL CONGRESS AND EXPOSITION to be held in Los Angeles, Calif., under the auspices of the American Society for Metals. The Congress will have headquarters at the Biltmore Hotel, and the Exposition will be held in the Pan American Auditorium. W. H. Eisenman, secretary, 7301 Euclid Ave., Cleveland, Ohio.

JUNE 16-20—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Kansas City, Mo. C. E. Davies, secretary, 29 W. 39th St., New York City.

JUNE 23-27—Forty-fourth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS to be held at the Palmer House, Chicago, Ill., in conjunction with an exhibit of testing apparatus and related equipment. For further information, address the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa.

OCTOBER 12-15—Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Louisville, Ky. C. E. Davies, secretary, 29 W. 39th St., New York City.

OCTOBER 20-24—Twenty-third NATIONAL METAL CONGRESS AND EXPOSITION to be held in Convention Hall and Commercial Museum, Philadelphia, Pa. Further information can be obtained from W. H. Eisenman, secretary, American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

* * *

Disston Saw, Measuring 10 Feet in Diameter and Weighing 3800 Pounds

Giant Metal-Cutting Saw

What is believed to be the world's largest metal-cutting saw has recently been made by Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa. This saw, as shown in the accompanying illustration, weighs 3800 pounds and is of the inserted-tooth type. It was made for the Consolidated Machine Tool Corporation, Rochester, N. Y.

The saw is 120 inches in diameter, with a center hole 12 inches in diameter. The thickness of the saw body is 1 1/16 inches. It has eighty teeth, each tooth being 3 7/8 inches long by 1 17/32 inches thick. The width of the cutting edge is 1 1/4 inches. The weight of each tooth is approximately 2 pounds. The eight men shown in the photograph are Disston employes who helped to make the saw.

OBITUARIES

C. R. Messinger

C. R. Messinger, president of the Chain Belt Co., Milwaukee, Wis., died suddenly of a heart attack, on February 4, at his home in Milwaukee, aged fifty-seven years. In addition to being president of the Chain Belt Co., he was chairman of the board of directors of the

C. R. Messinger

Oliver Farm Equipment Co., Chicago, and the Sivyer Steel Casting Co., Milwaukee, as well as several other companies.

Mr. Messinger was born in New Haven, Conn., on October 28, 1883. After attending the New Haven public schools, he went to Sheffield Scientific School of Yale University, from which he graduated in 1906. At the beginning of 1917, he became affiliated with the Chain Belt Co. as vice-president and general manager. Six years later he was elected president of the company, and in 1931 became chairman of the board. In 1934, upon the death of Clifford F. Messinger, then president of the company, Mr. Messinger returned as president and remained executive head from that time until his death.

In addition to his business connections, he was interested in various civic, charitable, and educational undertakings. He was a member of the American Society of Mechanical Engineers.

William T. Morgan

William Trefor Morgan, chief metallurgist of the Taylor Instrument Companies, Rochester, N. Y., died recently. Mr. Morgan was born on May 27, 1895, in Swansea, Wales. He attended the Swansea Technical College, Sheffield University, at Sheffield, England. His academic career, however, was interrupted by the first World War in which he served five years, four in active service in France, Egypt, and Palestine.

After the war he was associated with R. D. Thomas & Co., steel and tin-plate manufacturers in Swansea, and then joined the department of scientific research of the British Admiralty, with which he was connected for six years. After coming to this country he was associated with Babcock & Wilcox, of Bayonne, N. J., and in August, 1929, became connected with the Taylor Instrument Companies, assuming charge of the metallurgical laboratory, and served as chief metallurgist of the company from that time on.

He was a member of the American Institute of Mining and Metallurgical Engineers, the Iron and Steel Institute of Great Britain, the American Welding Society, and was a past chairman of the Rochester Chapter of the American Society for Metals, which he was instrumental in developing. Mr. Morgan is survived by his wife and daughter. His death is a great loss both to the company and to his profession.

Edward P. Connell, secretary-treasurer and general manager of the Falk Corporation, Milwaukee, Wis., died on February 8, after a short illness, at the age of fifty-six years. Mr. Connell had been with the corporation for twenty-eight years, starting as an accountant in 1913 and later serving as purchasing agent and comptroller. He was appointed treasurer of the firm in 1939, and became general manager in 1940. He was also a director.

For many years Mr. Connell had been active in the affairs of the American Gear Manufacturers' Association, serving on a number of committees. Before joining the Falk Corporation, he was connected with the Lake Shore Engineering Co. of Marquette, Mich., for ten years. Mr. Connell was a familiar and respected figure in the gear industry, and his loss will be felt keenly by the many who knew him and worked with him.

George Klenk, for many years superintendent of the brass foundry of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., and well known throughout the country in non-ferrous foundry circles, died of a heart attack at his home in Milwaukee on February 14 in his seventy-seventh year. He had been connected with the Allis-Chalmers organization and its predecessors for more than fifty years, after which he retired from active service, but continued to serve in a consulting capacity until his death.

One of the outstanding men in his field, he was consulted by many on all problems pertaining to brass foundry practice. He developed a successful method for molding cast blading for steam turbines, and produced many new useful metal combinations of brass and aluminum. He was an active member of the American Foundrymen's Association.

George Richards Lamb, retired director and for thirty-five years Cleveland district sales manager of the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., died on January 19 in Thomasville, Ga., following a short illness. Mr. Lamb was born in Waterbury, February 11, 1875. He had been associated with the Waterbury company for forty years. His father was the first superintendent of the company, and later vice-president and general manager.

H. J. Eltz, works superintendent of the Brown & Sharpe Mfg. Co., Providence, R. I., died on January 31, following a brief illness, in his fifty-eighth year. Mr. Eltz had been connected with the company over thirty-three years, and had served as works superintendent since 1925.

* * *

Aircraft Welding Prize Contest

A series of prizes to be awarded by the American Welding Society at its annual meeting next October, for papers to advance the art of welding aircraft steels, including tubing and other steel parts for tubular assemblies, has been offered by the Summerill Tubing Co., Bridgeport, Pa. For papers judged worthy of award, there will be one $300 prize, one $200 prize, and additional prizes totaling $100 to be awarded for such other papers as the Committee of Awards may decide upon. The papers may deal with any type of welding which is, or can be, used for the fabrication of aircraft steel structures or assemblies. They may cover any phase of the problem, such as joint design, fabrication, or laboratory investigations. The contest is open to any resident of the United States.

The papers must be submitted not later than August 18, 1941, to the Aircraft Welding Contest, American Welding Society, 33 W. 39th St., New York City. Additional information can be obtained from the Society.

* * *

Tool Engineers Form Seattle Chapter

A new chapter of the American Society of Tool Engineers has been formed at Seattle, Wash. This brings the total number of chapters throughout the country to forty. The rapid growth of the Society is further shown by a report that the membership increased more than 50 per cent during 1940.

NEW BOOKS AND PUBLICATIONS

THE METALLURGY OF DEEP DRAWING AND PRESSING. By J. Dudley Jevons. 699 pages, 6 by 9 1/2 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $10.

This work represents a comprehensive study of the process of deep drawing from the point of view of the metallurgist. It is pointed out in the foreword that little has been published in the past on this subject, owing to the fact that the art of deep drawing is still, relatively speaking, in its youth, and its commercial development has been so rapid that the codification of the principles underlying the process has of necessity followed in the wake of practice. This book, therefore, written by the chief metallurgist of a group of works producing drawn parts on an enormous scale, should be of great interest to those desiring to study the behavior of sheet metal when subjected to drawing and forming operations in a press and the factors influencing such action.

The book treats of the production of brass sheet and steel sheet; the defects and difficulties encountered in fabricating these materials in presses; and the deep drawing of metals other than brass and steel, including aluminum, magnesium, nickel alloys, and stainless steel.

Shop practice is discussed only in so far as it may interest the metallurgist through the effect on the behavior of the metal. There are chapters dealing briefly with press design; tools; lubricants; testing of sheet metal; and new applications of deep drawing and pressing. The final chapters treat of desired improvements in metal and in press-shop procedure. An appendix covers the application of X-ray examination.

GUIDE TO LIBRARY FACILITIES FOR NATIONAL DEFENSE. Edited by Carl L. Cannon. 235 pages, 8 1/2 by 11 inches. Published by the American Library Association, Chicago, Ill. Price, $1.25.

This guide contains a list of the books on war industries and other war topics available in both the general and special libraries of the country. It is divided into sections according to subjects, such as aeronautics, agriculture, automobile industry, chemicals, construction, etc., and under each subject there is a further subdivision according to the geographical location of the libraries. The work was undertaken as an aid to the National Defense Program by the Joint Committee on Library Research Facilities for National Emergency.

MECHANICAL WORLD YEAR BOOK (1941). 360 pages, 4 by 6 1/4 inches. Published by Emmott & Co., Ltd., 31 King St., W., Manchester, England. Price, 2/, net.

This well-known little handbook, now in its fifty-fourth year of publication, contains condensed data for the mechanical engineer. The present edition includes some new material, among which is a completely new set of tables of ball and roller bearings, and formulas permitting of quick selection of the bearing required for definite service conditions and for any speed. New material is also included on the various case-hardening processes. Obviously, the selection of matter for this edition has been guided to a large extent by wartime needs.

CARE AND OPERATION OF PORTABLE PRECISION LATHE GRINDERS. By Fred O. Orthey, Sales Engineer. 14 pages, 8 1/2 by 11 inches. Distributed by the Dumore Co., Racine, Wis. Price, 25 cents.

This is a mimeographed booklet containing a general description of the grinding process; some of the problems of precision grinding; and typical money saving grinding set-ups that can be used to advantage in the average shop. It tells how to select the grinder; how to select the proper wheel; safety precautions; reasons for chatter and method of elimination; maintenance of Dumore grinders, etc.

A STUDY OF THE EFFECT OF PRACTICE ON THE ELEMENTS OF A FACTORY OPERATION. By Ralph M. Barnes and James S. Perkins, with the assistance and collaboration of J. M. Juran. 95 pages, 6 by 9 inches. Published by State University of Iowa, Iowa City, Iowa. Price, 75 cents.

This booklet contains the results of an exhaustive study of the effect of practice on the elements of a factory operation conducted jointly by the University of Iowa and the Western Electric Co. The experiments were made with six subjects, and the operation used as the basis was the feeding of parts to a punch press.

REPORT OF THE RESEARCH AND EXTENSION ACTIVITIES OF THE ENGINEERING SCHOOLS AND DEPARTMENTS OF PURDUE UNIVERSITY FOR THE SESSIONS 1939-1940. 71 pages, 6 by 9 inches. Published by Purdue University, Lafayette, Ind., as Research Series No. 77 of the Engineering Experiment Station.

A Device Known as the "Industrial Mule," which is Manufactured by R. D. Eaglesfield, Indianapolis, Ind., is Designed to Move Lift-trucks, Towing Trucks, Tote Boxes, or Drums. A Gasoline Engine, Mounted in the Wheel, Supplies Power through a Sprocket Operating in a Ring Gear on the Inside of the Rim. A Rod through the Steering Column Operates the Clutch and Brake, and Supports the Throttle Control